

EN 301 511 V12.5.1 (2017-03)

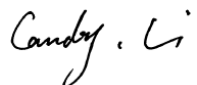
**RF TEST REPORT**

For

**Shenzhen Huafurui Technology Co., Ltd.**

Unit 1401 & 1402, 14/F, Jinqi Zhigu Mansion (No.4 Building of Chongwen Garden), Crossing of the Liuxian Street and Tangling Road, Taoyuan Street, Nanshan District, Shenzhen, P.R. China

**Tested Model: NOTE 9**

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<b>Report Number:</b> SZ1210419-12396E-22F	
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Candy Li 	
<b>Reviewed By:</b> RF Engineer	
<b>Prepared By:</b> Shenzhen Accurate Technology Co., Ltd. 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China Tel: +86-755-26503290 Fax: +86-755-26503396 <a href="http://www.atc-lab.com">www.atc-lab.com</a>	

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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Product	Smartphone
Tested Model	NOTE 9
Trade mark	CUBOT
Frequency Range	EGSM900: 880-915 MHz (TX), 925-960 MHz (RX) DCS1800: 1710-1785 MHz (TX), 1805-1880 MHz (RX)
Transmit Power	GSM900: 32.11dBm (GMSK), 27.20(8PSK) DCS 1800: 29.19dBm (GMSK), 26.25(8PSK)
Maximum Antenna gain	GSM900: 0.68dBi; DCS1800: 0.66dBi;
Modulation Technique	GMSK/8PSK
Voltage Range	DC 3.85V from battery or DC 5.0V from adapter
Date of Test	2020-05-08
Sample serial number	SZ1210419-12396E-22F-RF-S1
Received date	2021-04-05
Sample/EUT Status	Good condition
Normal/Extreme Condition	N.V.: Nominal Voltage: 3.85V <sub>DC</sub> L.V.: Low Voltage 3.6 V <sub>DC</sub> ; L.T.: Low Temperature 0°C N.V.: Normal Voltage 4.2V <sub>DC</sub> ; N.T.: Normal Temperature +25°C H.V.: High Voltage 4.4V <sub>DC</sub> ; H.T.: High Temperature +45°C The extreme condition was declared by the manufacture
Adapter 1 information	Model: HJ-0501500-UK Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5V, 1.5A
Adapter 2 information	Model: HJ-0501500W2-EU Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5V, 1.5A

### Objective

This test report is in accordance with EN 301 511 V12.5.1 (2017-03), Global System for Mobile communications (GSM); Mobile Stations (MS) equipment; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU.

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.).

## Test Methodology

All measurements contained in this report were conducted as specified in EN 301 511 V12.5.1 (2017-03).

All radiated and conducted emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Measurement Uncertainty

Parameter		Uncertainty
Spurious Emissions, Radiated	9k-30MHz	±2.66dB
	30MHz-1000MHz	±4.28dB
	1GHz-18GHz	±4.98dB
	18GHz-26.5GHz	±5.06dB

*Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.*

## SYSTEM TEST CONFIGURATION

### Justification

The EUT and test equipment were configured for testing according to EN 301 511 V12.5.1 (2017-03).

### EUT Exercise Software

No exercise software.

### Special Accessories

No special accessory.

### Equipment Modifications

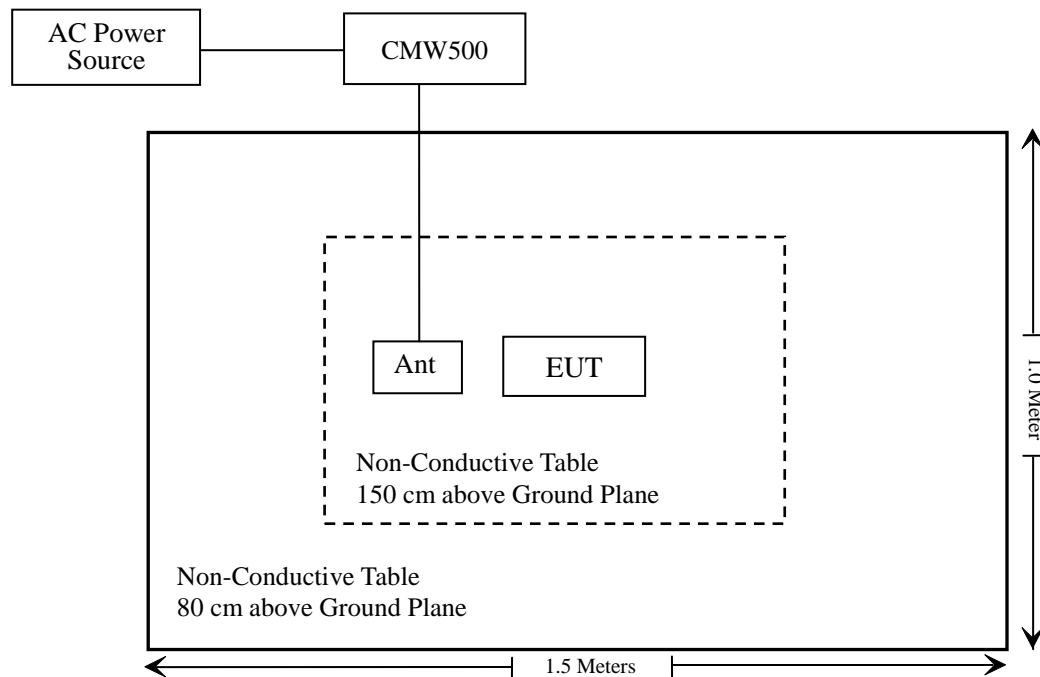
No modification was made to the EUT.

### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	154606

### External I/O Cable

Cable Description	Length (m)	From Port	To
/	/	/	/

**Block Diagram of Test Setup**

## SUMMARY OF TEST REPORT

EN 301 511 V12.5.1 (2017-03)	Description of Test	Result
Section 4.2.1	Transmitter – Frequency error and phase error	Compliance
Section 4.2.2	Transmitter – Frequency error under multi path and interference conditions	Compliance
Section 4.2.3	Transmitter – Frequency error and Phase Error in HSCSD Multi slot Configuration	Not Applicable
Section 4.2.4	Frequency error and phase error in GPRS multi slot configuration	Compliance
Section 4.2.5	Transmitter output power and burst timing	Compliance
Section 4.2.6	Transmitter – Output RF spectrum	Compliance
Section 4.2.7	Transmitter output power and burst timing in HSCSD multi slot configuration	Not Applicable
Section 4.2.8	Transmitter – Output RF spectrum in HSCSD multi slot configuration	Not Applicable
Section 4.2.9	Transmitter - Output RF spectrum for MS supporting the R-GSM or ER-GSM frequency band	Not Applicable
Section 4.2.10	Transmitter output power in GPRS multi slot configuration	Compliance
Section 4.2.11	Output RF spectrum in GPRS multi slot configuration	Compliance
Section 4.2.12	Conducted spurious emissions – MS allocated a channel	Compliance
Section 4.2.13	Conducted spurious emission – MS in idle mode	Compliance
Section 4.2.14	Conducted spurious emissions for MS supporting the R-GSM or ER-GSM frequency band - MS allocated a channel	Not Applicable
Section 4.2.15	Conducted spurious emissions for MS supporting the R-GSM or ER-GSM frequency band - MS in idle mode	Not Applicable
Section 4.2.16	Radiated spurious emissions – MS allocated a channel	Compliance
Section 4.2.17	Radiated spurious emissions – MS in idle mode	Compliance
Section 4.2.18	Radiated spurious emissions for MS supporting the R-GSM or ER-GSM frequency band - MS allocated a channel	Not Applicable
Section 4.2.19	Radiated spurious emissions for MS supporting the R-GSM or ER-GSM frequency band - MS in idle mode	Not Applicable
Section 4.2.20	Receiver blocking and spurious responses – speech channels	Compliance
Section 4.2.21	Receiver Blocking and spurious response - speech channels for MS supporting the R-GSM or ER-GSM frequency band	Not Applicable
Section 4.2.22	Improved Receiver Blocking and spurious response - speech channels for 8W MS supporting the R-GSM or ER-GSM frequency band	Not Applicable
Section 4.2.23	Improved Receiver Blocking and spurious response - speech channels for 2W MS supporting the R-GSM or ER-GSM frequency band	Not Applicable
Section 4.2.24	Improved Receiver Blocking and spurious response - control channels for 8W MS supporting the R-GSM or ER-GSM frequency band not supporting speech	Not Applicable
Section 4.2.25	Improved Receiver Blocking and spurious response - control channels for 2W MS supporting the R-GSM or ER-GSM frequency band not supporting speech	Not Applicable
Section 4.2.26	Frequency error and modulation accuracy in EGPRS configuration	Compliance

<b>EN 301 511 V12.5.1 (2017-03)</b>	<b>Description of Test</b>	<b>Result</b>
Section 4.2.27	Frequency error under multi path and interference conditions in EGPRS configuration	Compliance
Section 4.2.28	EGPRS Transmitter output power	Compliance
Section 4.2.29	Output RF spectrum in EGPRS configuration	Compliance
Section 4.2.30	Blocking and spurious response in EGPRS configuration	Compliance
Section 4.2.31	Blocking and spurious response in DLMC configuration	Not Applicable
Section 4.2.32	Intermodulation rejection – speech channels	Compliance
Section 4.2.33	Intermodulation rejection – control channels	Not Applicable
Section 4.2.34	Intermodulation rejection - EGPRS	Compliance
Section 4.2.35	AM suppression - speech channels	Compliance
Section 4.2.36	AM suppression - control channels	Not Applicable
Section 4.2.37	AM suppression - packet channels	Not Applicable
Section 4.2.38	Adjacent channel rejection – speech channels (TCH/FS)	Compliance
Section 4.2.39	Adjacent channel rejection – control channels	Not Applicable
Section 4.2.40	Adjacent channel rejection - EGPRS	Compliance
Section 4.2.41	Adjacent channel rejection in DLMC configuration	Not Applicable
Section 4.2.42	Reference sensitivity - TCH/FS	Compliance
Section 4.2.43	Reference sensitivity - FACCH/F	Compliance
Section 4.2.44	Minimum Input level for Reference Performance - GPRS	Compliance
Section 4.2.45	Minimum Input level for Reference Performance - EGPRS	Compliance
Section 4.2.46	Reference sensitivity - TCH/FS for MS supporting the R-GSM or ER-GSM band	Not Applicable

## TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test</b>					
Rohde & Schwarz	Test Receiver	ESR	101817	2020/12/24	2021/12/23
SONOMA INSTRUMENT	Amplifier	310 N	186131	2020/12/25	2021/12/24
A.H. Systems, inc.	Preamplifier	PAM-0118P	531	2020/07/08	2021/07/07
Schwarzbeck	Bilog Antenna	VULB9163	9163-194	2021-01-05	2023-01-04
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021-01-05	2023-01-04
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-655	2021-01-05	2023-01-04
Schwarzbeck	Horn Antenna	BBHA9170	9170-359	2021-01-05	2023-01-04
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/12/24	2021/12/23
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	154606	2020/12/25	2021/12/24
Anritsu	Signal Generator	68369B	004114	2020/7/31	2021/7/30
<b>RF Conducted Test</b>					
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/12/24	2021/12/23
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	154606	2020/12/25	2021/12/24
Rohde & Schwarz	Fading Simulator	ABFS	100172	NCR	NCR
Gongwen	Temp. & Humid. Chamber	JB913R	GZ-WS004	2020/12/25	2021/12/24
Vector Signal Generator	AGILENT	N5182A	MY50143401	2020/12/25	2021/12/24
UNI-T	DC Power Supply	UTP8305B	10584	NCR	NCR
Fluke	Desktop Multi Meter	45	7664009	2020/12/25	2021/12/24

\* **Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## §4.2.1 - TRANSMITTER – FREQUENCY ERROR AND PHASE ERROR

### Applicable Standard

Requirement: Per EN 301 511 V12.5.1 (2017-03), 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.

### 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:

$$\varphi_m = \varphi_m(0) \dots \varphi_m(n)$$

where the number of samples in the array  $n+1 \geq 294$ .

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

$$\varphi_c = \varphi_c(0) \dots \varphi_c(n).$$

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

$$\varphi_e = \{\varphi_m(0) - \varphi_c(0)\}, \dots, \{\varphi_m(n) - \varphi_c(n)\} = \varphi_e(0) \dots \varphi_e(n).$$

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

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

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

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



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

$$\phi_e(j) - k \cdot t(j).$$

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

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

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

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

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

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

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

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

*EUT operation mode: Transmitting*

**Frequency error and phase error**

Mode	Test Channel	Test Condition					Result
GSM 900	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
DCS 1800	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

**Normal Condition Test Data as below:**

**GSM 900 (Middle Channel)**

0.1ppm means 90.2 Hz for frequency 902.0 MHz

GSM 900	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase error (degree)		Limit (degree)	Result
Reference Frequency 902.0 (MHz)	Normal	-4.78	90.2	Pass	RMS	0.49	5	Pass
					Peak	1.53	20	Pass

MS under maximum power control level

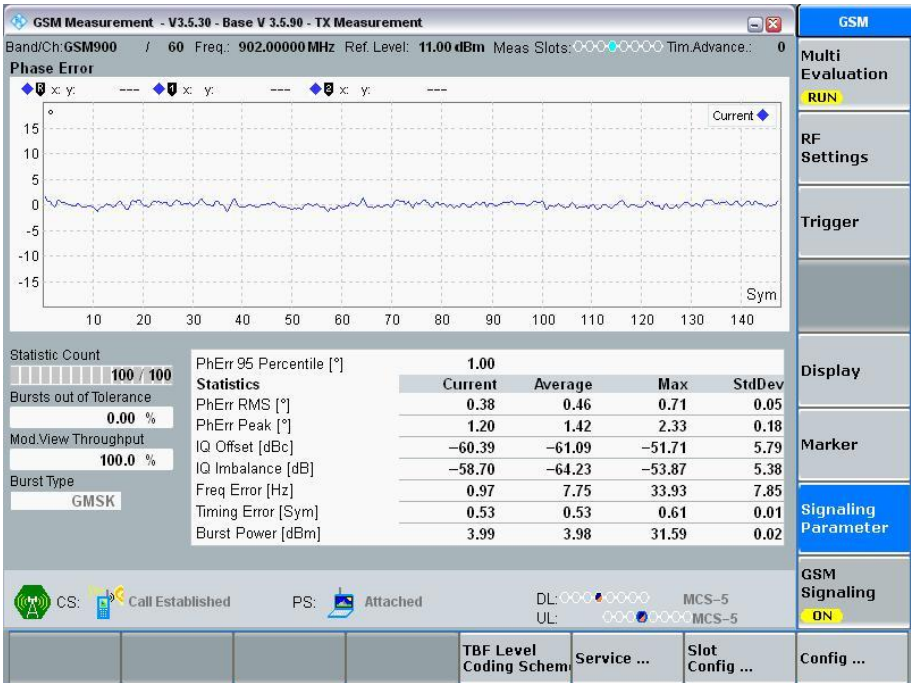
GSM 900	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase error (degree)		Limit (degree)	Result
Reference Frequency 1748.8 (MHz)	Normal	7.75	90.2	Pass	RMS	0.46	5	Pass
					Peak	1.42	20	Pass

MS under minimum power control level

Power Control Level 5 (Middle Channel)



Power Control Level 19 (Middle Channel)



**DCS1800 (Middle Channel)**

0.1ppm means 174.78 Hz for frequency 1747.8 MHz

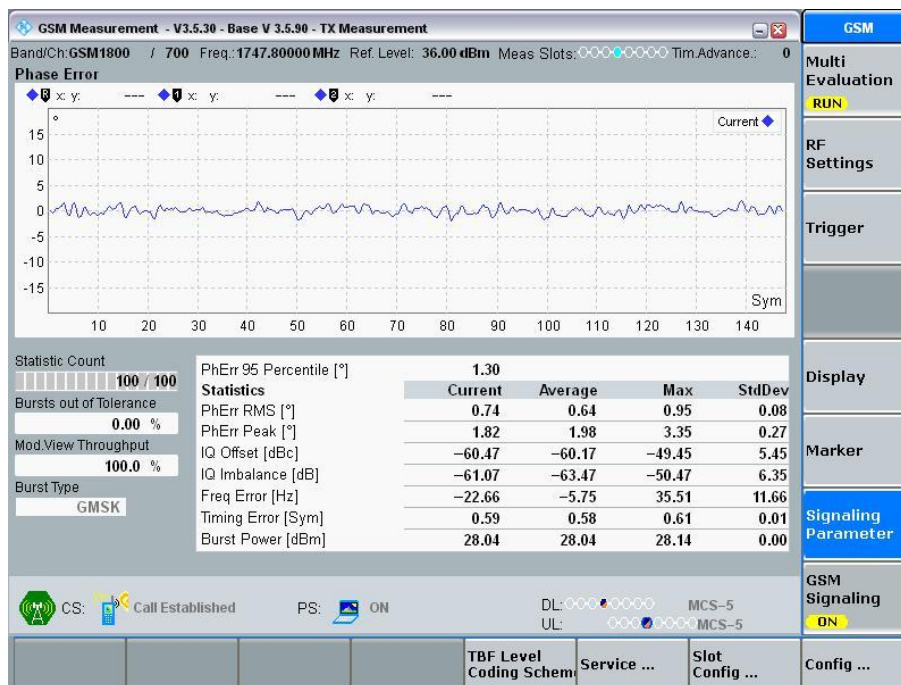
DCS1800	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency 1747.8 (MHz)	Normal	-5.75	174.78	Pass	RMS	0.64	5	Pass
					Peak	1.98	20	Pass

MS under maximum power control level

DCS1800	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency 1747.8 (MHz)	Normal	4.81	174.78	Pass	RMS	0.64	5	Pass
					Peak	1.97	20	Pass

MS under minimum power control level

## Power Control Level 0 (Middle Channel)



## Power Control Level 15 (Middle Channel)



## §4.2.2 - TRANSMITTER – FREQUENCY ERROR UNDER MULTIPATH AND INTERFERENCE CONDITIONS

### Applicable Standard

Requirement: Per EN 301 511 V12.5.1 (2017-03), 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.

### 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 to TU50 (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 midamble.
  - the fading function for all channels is set to TU low.

- j) The SS waits 100 s for the MS to stabilize to these conditions.
- k) Repeat steps d) to f), except that at step f) the measurement period must be extended to 200 s and the number of measurements increased to 20.
- l) The initial conditions are established again and steps a) to k) are repeated for ARFCN in the Low ARFCN range.
- m) The initial conditions are established again and steps a) to k) are repeated for ARFCN in the High ARFCN range.
- n) Repeat step h) under extreme test conditions

### Test Requirements:

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

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

GSM 850 and GSM 900		DCS 1800	
Propagation Condition	Permitted frequency error	Propagation Condition	Permitted frequency error
RA250	$\pm 300$ Hz	RA130	$\pm 400$ Hz
HT100	$\pm 180$ Hz	HT100	$\pm 350$ Hz
TU50	$\pm 160$ Hz	TU50	$\pm 260$ Hz
TU3	$\pm 230$ Hz	TU1.5	$\pm 320$ Hz

### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition					Result
GSM 900	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
DCS 1800	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass

**Normal Condition Test Data as below:****GSM 900 (Middle Channel)**1) *MS under maximum power control level: 5*

<b>EGSM 900</b>	<b>Test Condition</b>		<b>Frequency error (Hz)</b>	<b>Limit (Hz)</b>	<b>Result</b>
Ref. Freq. 902.0 (MHz)	Normal	RA250	95	±300	Pass
		HT100	28	±180	Pass
		TU50	22	±160	Pass
		TU3	33	±230	Pass

2) *MS under minimum power control level: 19*

<b>EGSM 900</b>	<b>Test Condition</b>		<b>Frequency error (Hz)</b>	<b>Limit (Hz)</b>	<b>Result</b>
Ref. Freq. 902.0 (MHz)	Normal	RA250	92	±300	Pass
		HT100	29	±180	Pass
		TU50	20	±160	Pass
		TU3	33	±230	Pass

**DCS 1800 (Middle Channel)**1) *MS under maximum power control level: 0*

<b>DCS 1800</b>	<b>Test Condition</b>		<b>Frequency error (Hz)</b>	<b>Limit (Hz)</b>	<b>Result</b>
Ref. Freq. 1747.8 (MHz)	Normal	RA130	90	±400	Pass
		HT100	25	±350	Pass
		TU50	18	±260	Pass
		TU1.5	21	±320	Pass

2) *MS under minimum power control level: 15*

<b>DCS 1800</b>	<b>Test Condition</b>		<b>Frequency error (Hz)</b>	<b>Limit (Hz)</b>	<b>Result</b>
Ref. Freq. 1747.8 (MHz)	Normal	RA130	88	±400	Pass
		HT100	33	±350	Pass
		TU50	31	±260	Pass
		TU1.5	30	±320	Pass



## §4.2.4 - FREQUENCY ERROR AND PHASE ERROR IN GPRS MULTISLOT CONFIGURATION

### Applicable Standard

According to EN 301 511 V12.5.1 (2017-03), 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.

### 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 ( $\alpha$ ) to 0 and GAMMA\_TN ( $\Gamma_{CH}$ ) 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:

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

where the number of samples in the array  $n+1 \geq 294$ .

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

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

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

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

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

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

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

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:

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

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

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

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

The testing was performed by Fan Yang on 2021-05-08.

Mode	Test Channel	Test Condition					Result
GSM 900	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
DCS 1800	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass

Normal Condition Test Data as below:

**GSM900 (Middle Channel)**

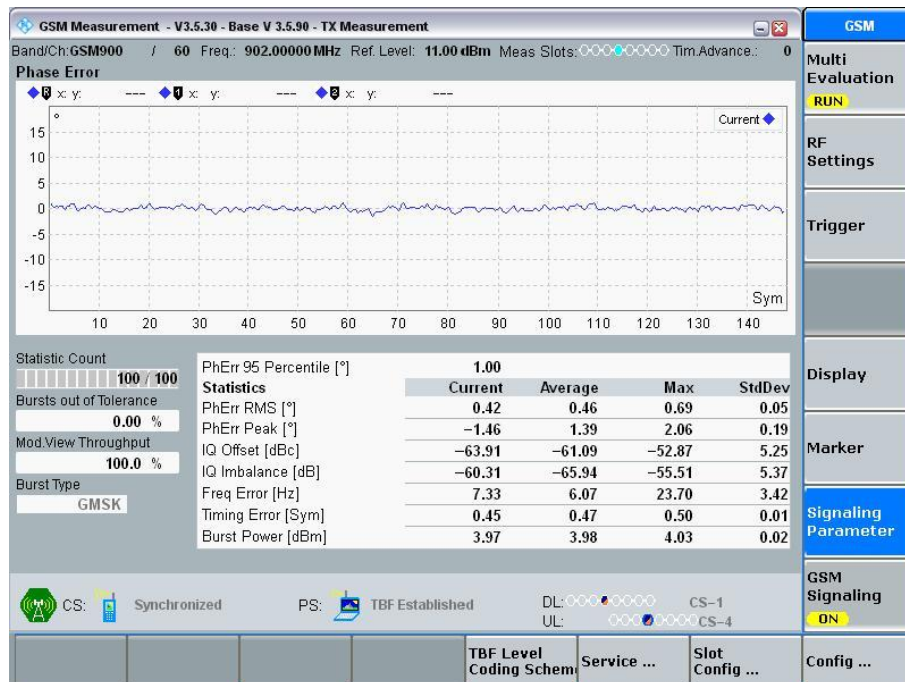
0.1ppm means 90.2 Hz for frequency 902.0 MHz

GSM 900 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency  902.0 (MHz)	Normal	7.1	90.2	Pass	RMS	0.5	5	Pass
					Peak	1.51	20	Pass

MS under maximum level

GSM 900 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency  902.0 (MHz)	Normal	6.07	90.2	Pass	RMS	0.46	5	Pass
					Peak	1.39	20	Pass

MS under minimum level

**Normal Condition:****Maximum Power Control Level 3 (Middle Channel)****Minimum Power Control Level 17 (Middle Channel)**

**DCS1800 (Middle channel)**

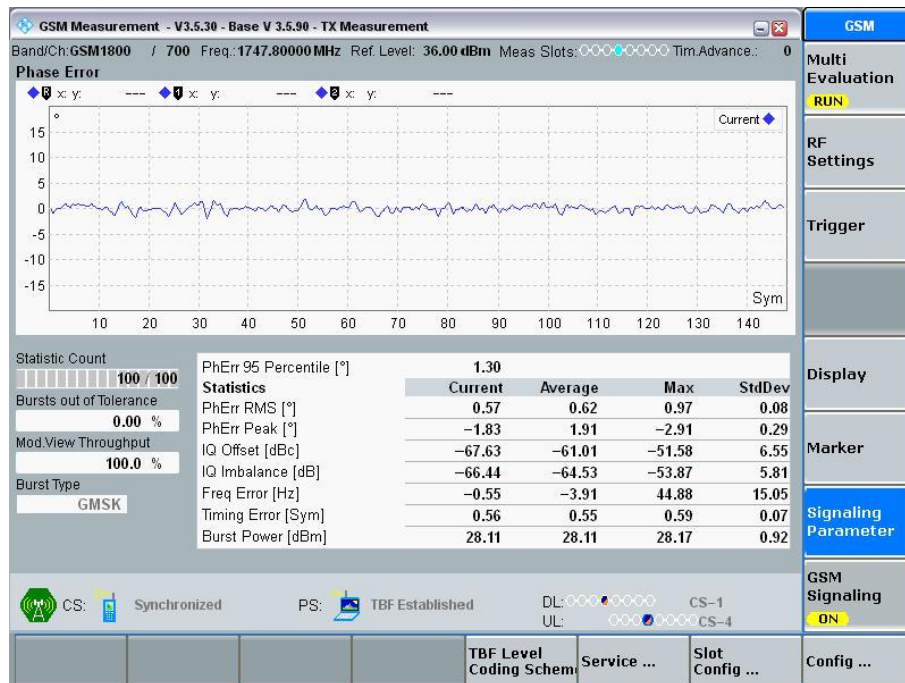
0.1ppm means 174.78 Hz for frequency 1747.8 MHz

DCS1800 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency  1747.8 (MHz)	Normal	-3.91	174.78	Pass	RMS	0.62	5	Pass
					Peak	1.91	20	Pass

MS under maximum level

DCS1800 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency  1747.8 (MHz)	Normal	0.55	174.78	Pass	RMS	0.64	5	Pass
					Peak	1.98	20	Pass

MS under minimum level

**Normal Condition:****Maximum Power Control Level 3 (Middle Channel)****Minimum Power Control Level 18 (Middle Channel)**

## §4.2.5 - TRANSMITTER OUTPUT POWER AND BURST TIMING

### Applicable Standard

According to EN 301 511 V12.5.1 (2017-03), 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  $\pm 2$  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  $\pm 2,5$  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  $\pm 3$  dB,  $\pm 4$  dB or  $\pm 5$  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  $\pm 4$  dB,  $\pm 5$  dB or  $\pm 6$  dB under extreme conditions; 3GPP TS 05.05, sub clause 4.1.1; 3GPP TS 05.05 annex D subclasses 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  $2 \pm 1,5$  dB ( $1 \pm 1$  dB 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  $\pm 1$  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.

## 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 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 1800 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.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

**Test Results:** Pass.

*The testing was performed by Fan Yang on 2021-05-08.*

Please refer to following tables and plots.

Mode	Test Channel	Test Condition					Result
GSM 900	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
DCS 1800	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

**Normal Condition Test Data as below:**

**GSM900 Output Power in GSM**

Power Control Level	Output power (dBm)			Result
	Low Channel	Middle Channel	High Channel	
5	31.96	32.11	32.03	
6	29.14	30.13	30.44	
7	27.15	28.79	28.28	
8	25.41	26.87	26.07	
9	23.02	24.17	24.04	
10	21.07	22.34	22.59	
11	19.16	20.93	20.94	
12	17.52	18.01	18.11	
13	15.82	15.97	15.16	
14	13.27	13.71	13.57	
15	11.21	11.66	11.26	
16	9.78	9.84	9.00	
17	7.34	7.16	7.45	
18	5.53	5.15	5.84	
19	3.62	3.71	3.64	

**DCS1800 Output Power in GSM**

Power Control Level	Output power (dBm)			Result
	Low Channel	Middle Channel	High Channel	
0	29.14	29.19	28.74	
1	27.10	27.95	26.25	
2	25.59	25.26	23.70	
3	23.45	23.90	21.72	
4	21.76	21.89	19.88	
5	19.05	19.46	17.99	
6	16.92	16.49	16.01	
7	14.11	14.35	13.56	
8	12.52	12.83	11.63	
9	10.38	10.24	9.07	
10	8.07	7.98	7.56	
11	5.99	5.35	5.32	
12	3.84	3.30	3.89	
13	1.79	1.26	1.59	
14	0.74	0.80	0.67	
15	-1.00	-0.88	-1.11	

## §4.2.6 - TRANSMITTER – OUTPUT RF SPECTRUM

### Applicable Standard

Requirements: According to EN 301 511 V12.5.1 (2017-03), 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 V12.8.0 (2016-05), 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

## 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.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

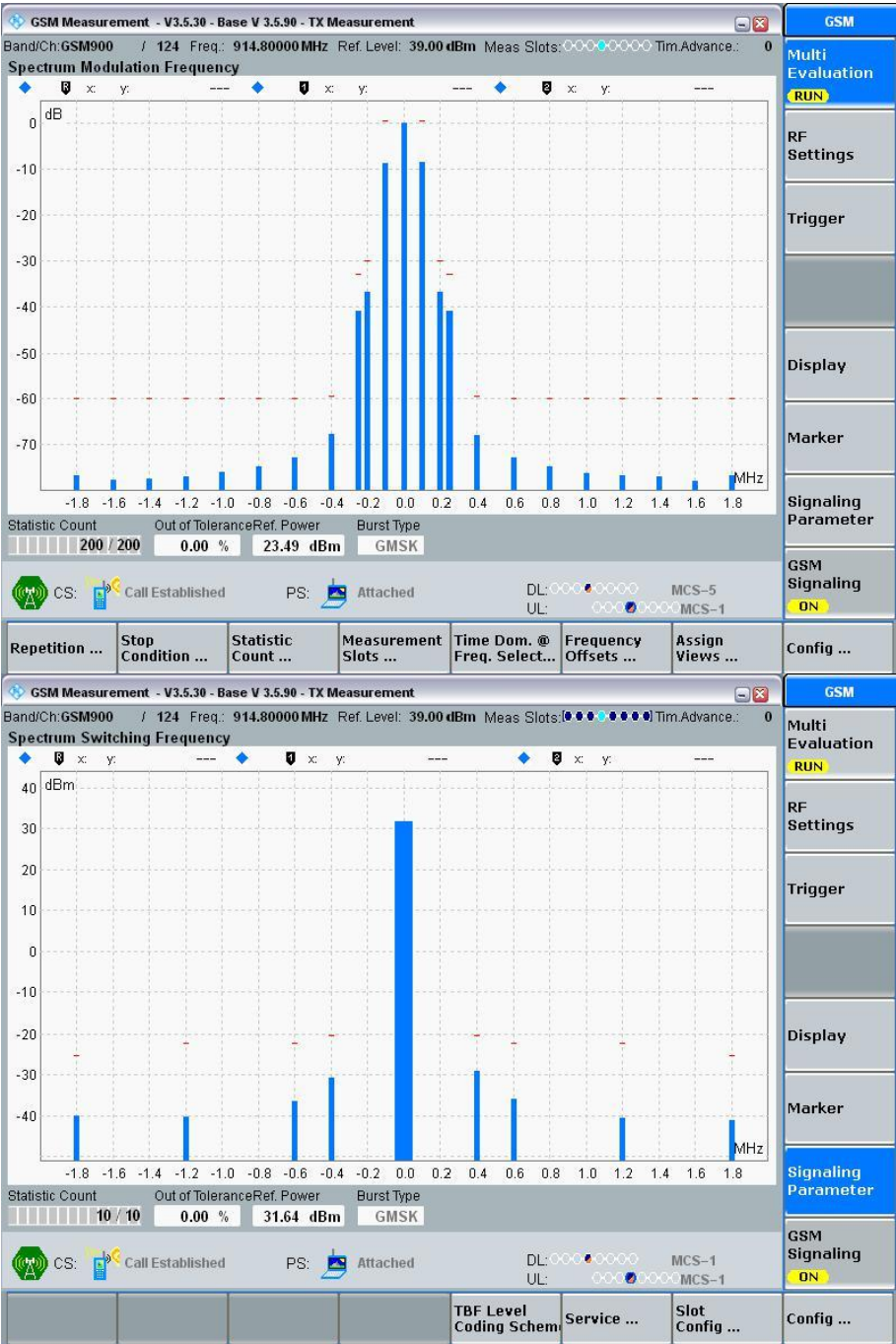
**Test Results:** Pass

Mode	Test Channel	Test Condition					Result
GSM 900	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
DCS 1800	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

**Normal Condition Test Data as below:**

GSM900:

Normal Condition Power Control Level 5, High Channel



**GSM Measurement - V3.5.30 - Base V 3.5.90 - TX Measurement**

Band/Ch: GSM900 / 124 Freq.: 914.80000 MHz Ref. Level: 11.00 dBm Meas Slots: [●●●●●●●●] Tim Advance: 0

### Spectrum Modulation Frequency

Statistic Count	Out of Tolerance	Ref. Power	Burst Type
200 / 200	0.00 %	-3.97 dBm	GMSK

CS: [Call Established] PS: [Attached] DL: [MCS-1] UL: [MCS-1]

Repetition ...	Stop Condition ...	Statistic Count ...	Measurement Slots ...	Time Dom. @ Freq. Select...	Frequency Offsets ...	Assign Views ...

---

**GSM Measurement - V3.5.30 - Base V 3.5.90 - TX Measurement**

Band/Ch: GSM900 / 124 Freq.: 914.80000 MHz Ref. Level: 11.00 dBm Meas Slots: [●●●●●●●●] Tim Advance: 0

### Spectrum Switching Frequency

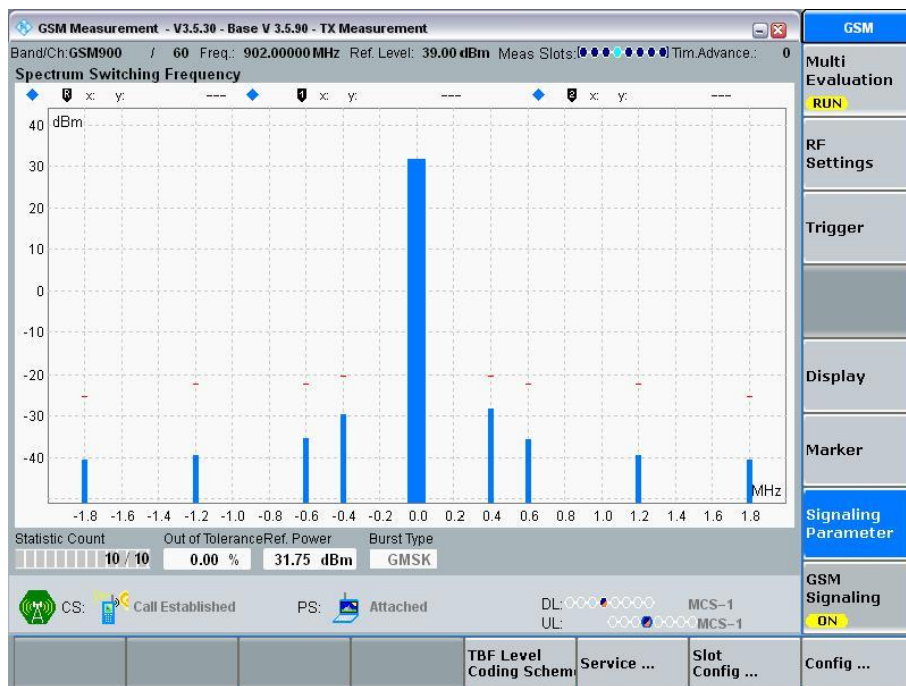
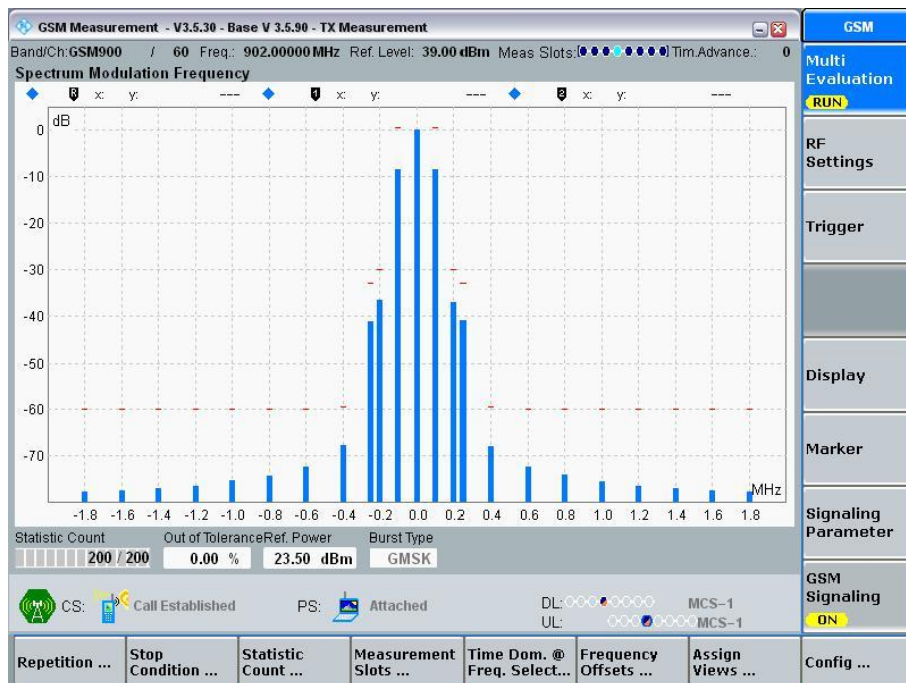
Statistic Count	Out of Tolerance	Ref. Power	Burst Type
10 / 10	0.00 %	4.03 dBm	GMSK

CS: [Call Established] PS: [Attached] DL: [MCS-1] UL: [MCS-1]

TBF Level Coding Scheme	Service ...	Slot Config ...

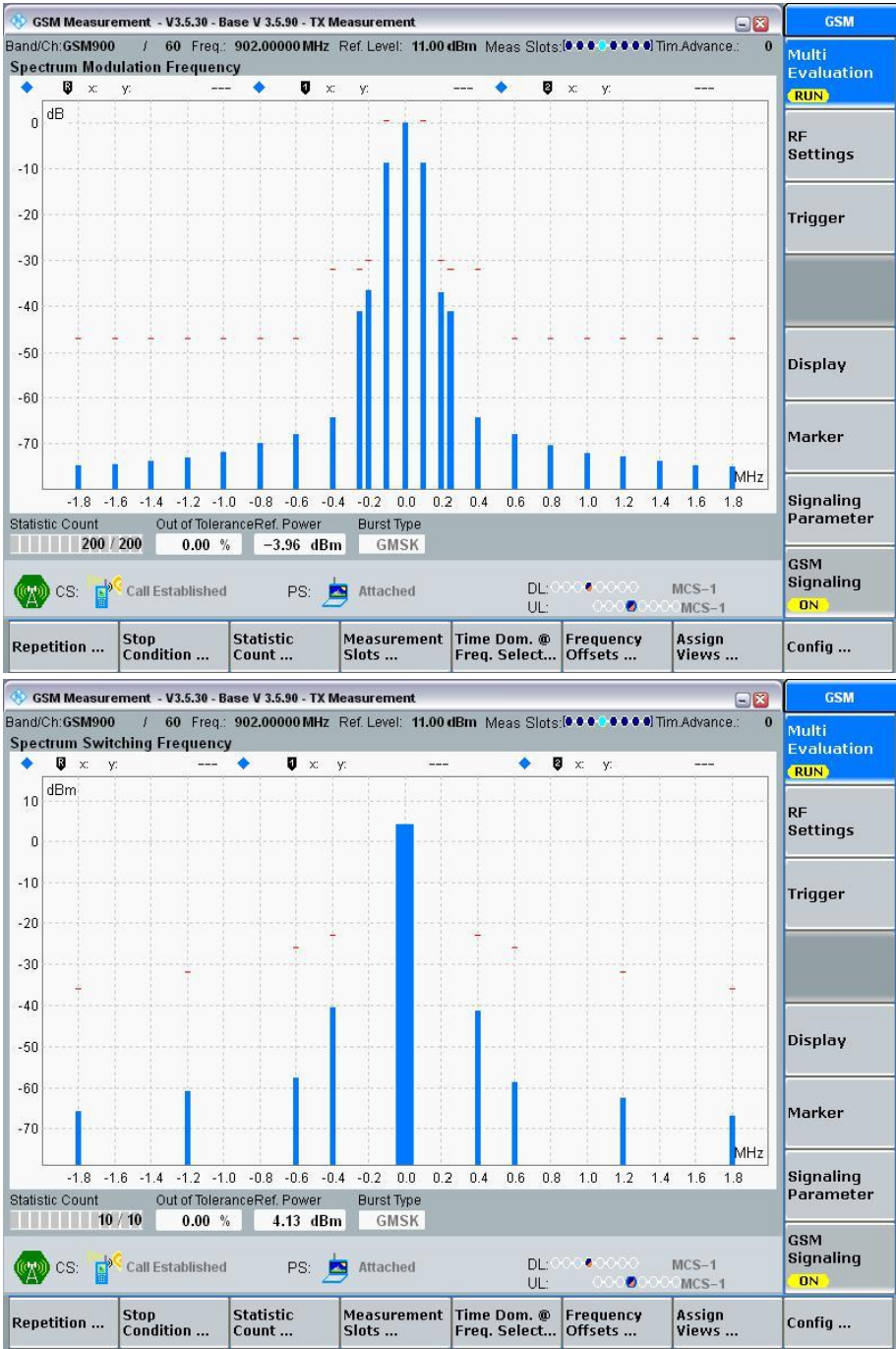


## Normal Condition Power Control Level 5, Middle Channel

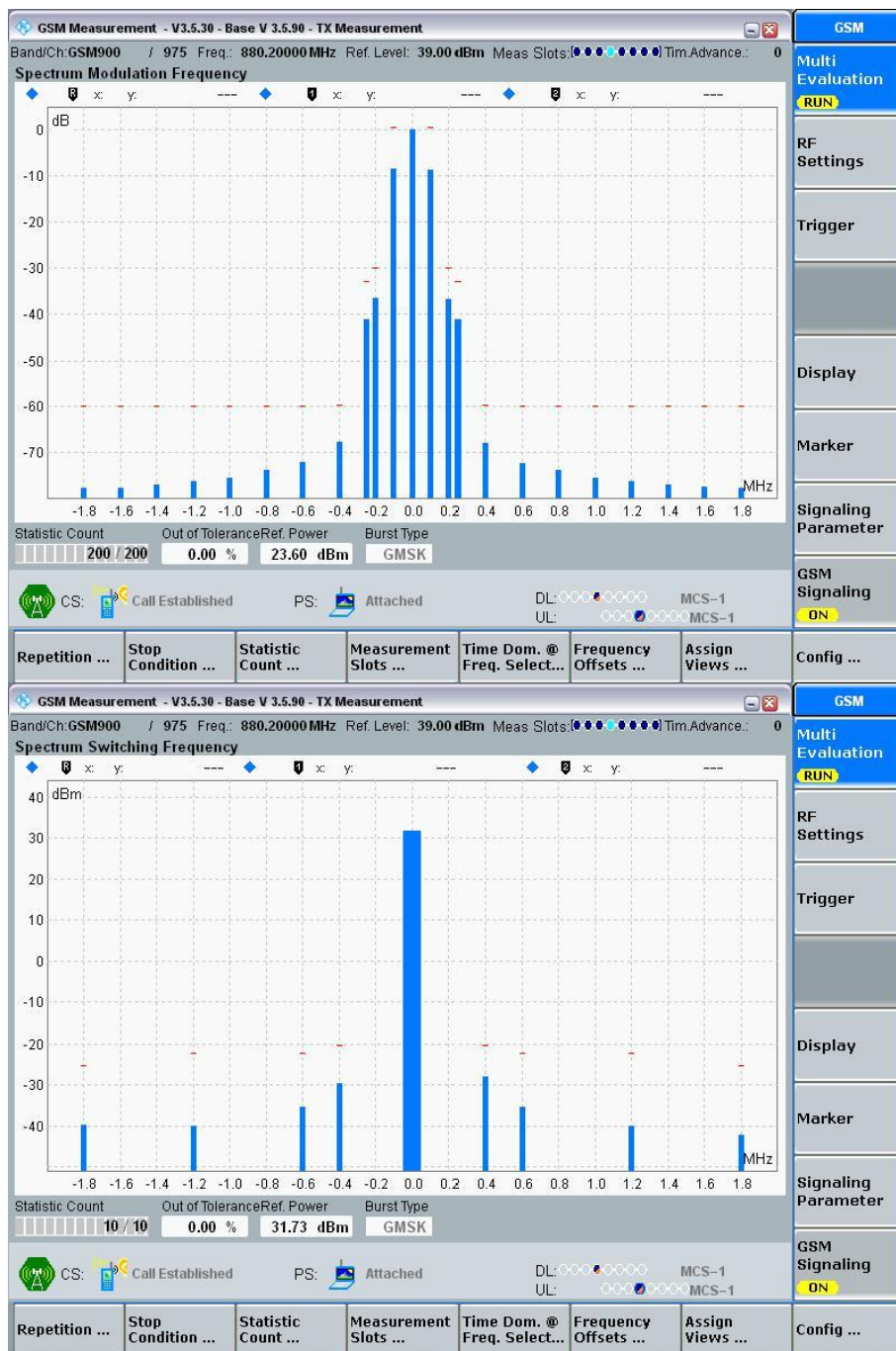




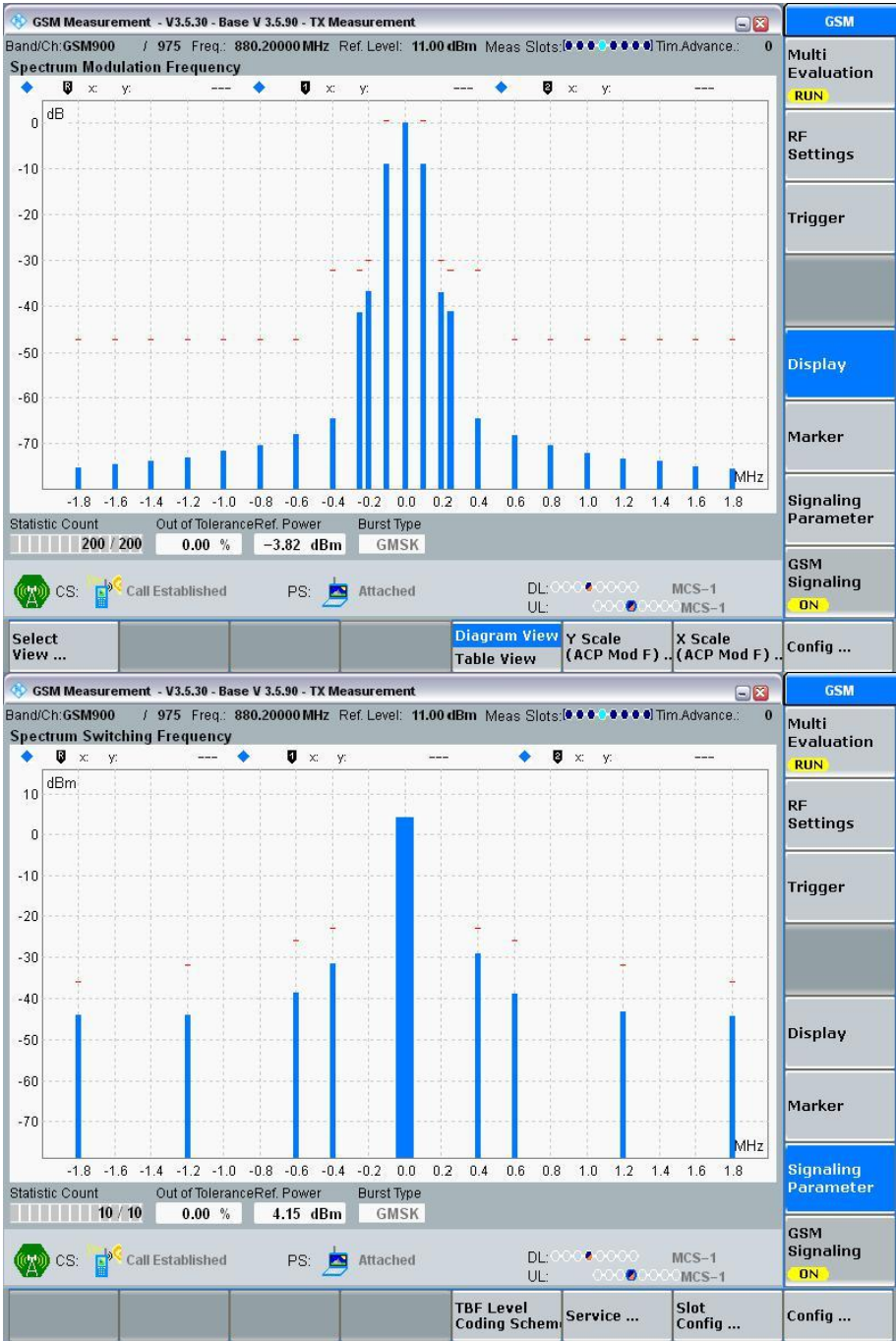
Normal Condition Power Control Level 19, Middle Channel

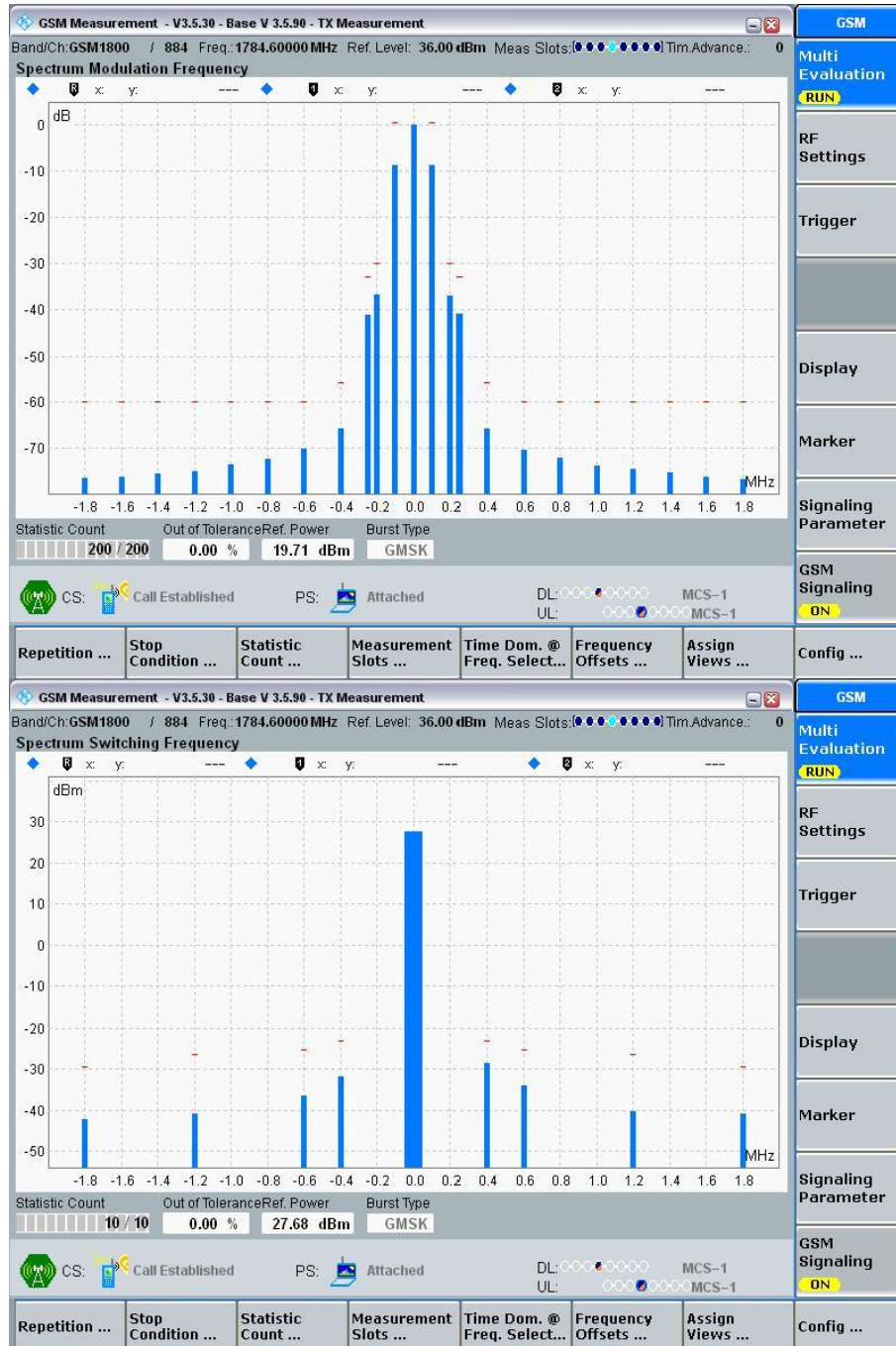


## Normal Condition Power Control Level 5, Low Channel



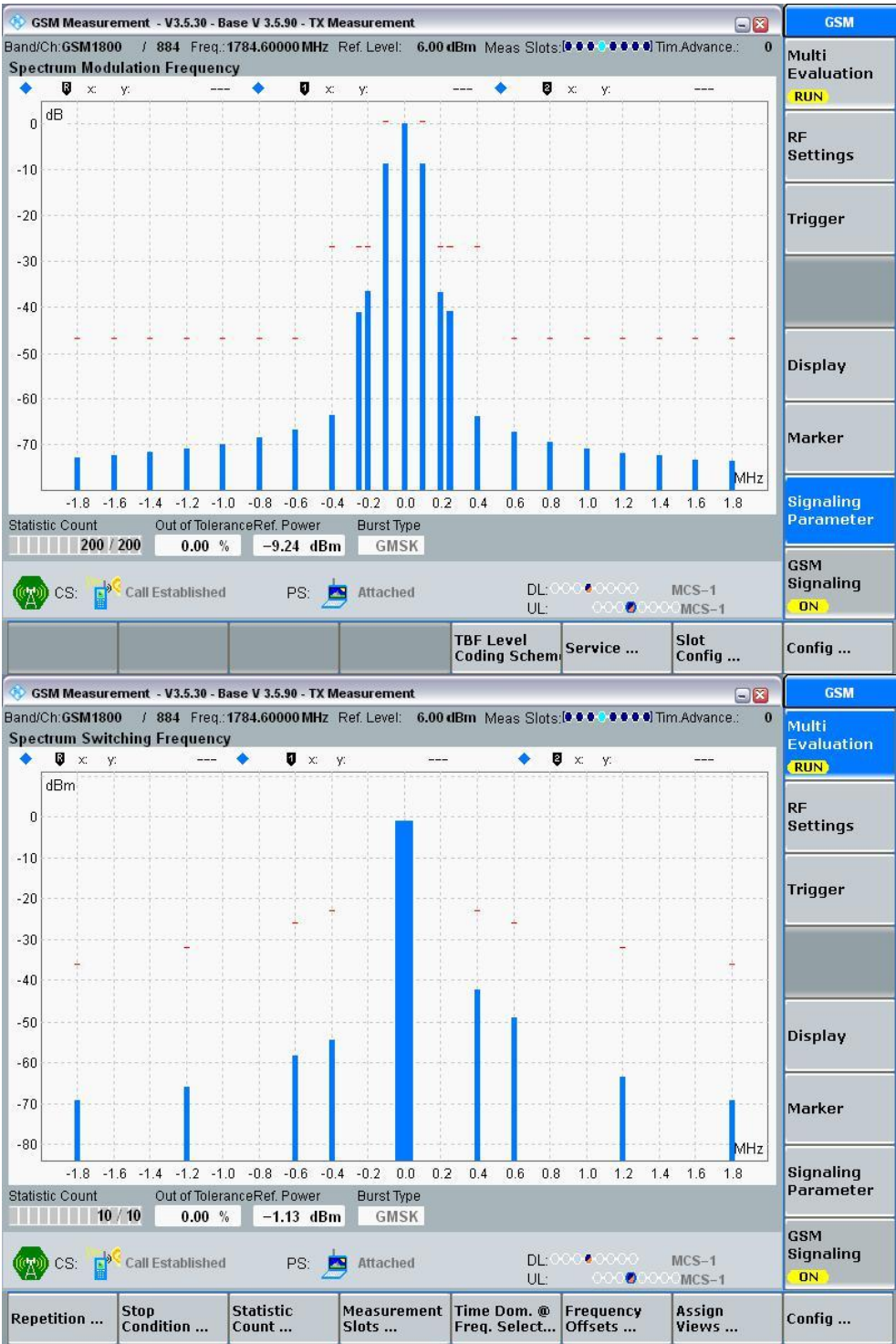
Normal Condition Power Control Level 19, Low Channel



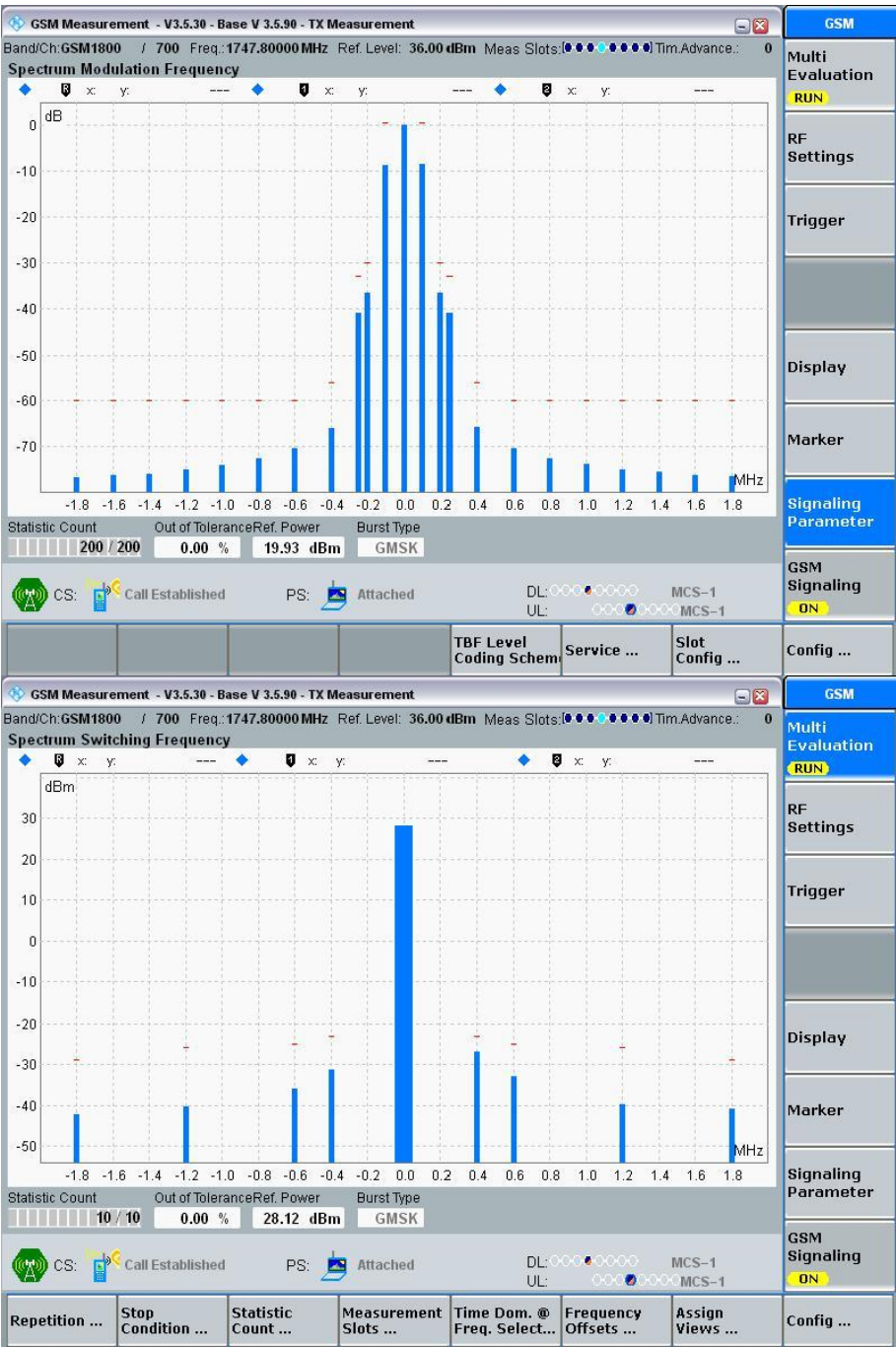
**DCS1800:****Normal Condition Power Control Level 0, High Channel**



Normal Condition Power Control Level 15, High Channel



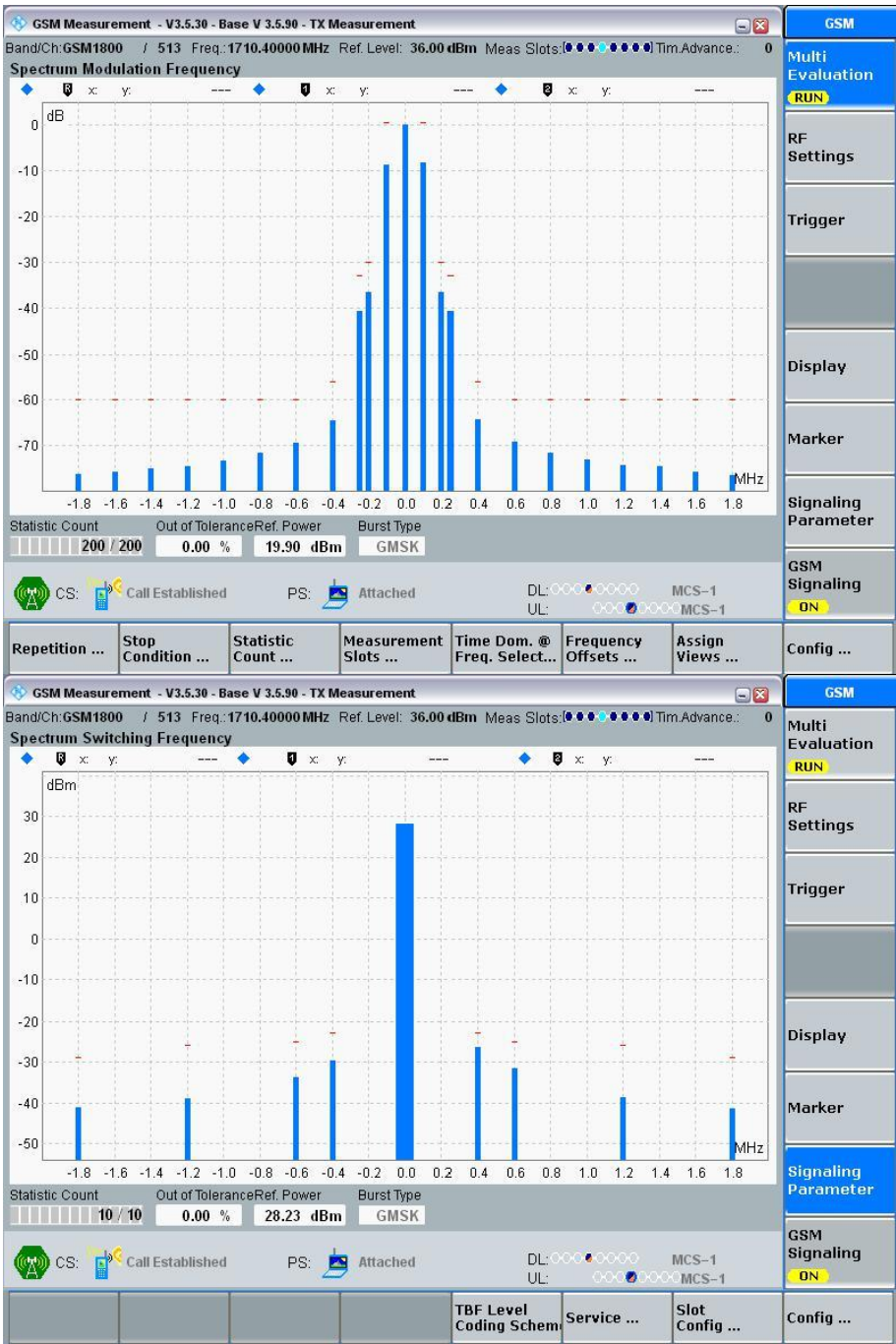
Normal Condition Power Control Level 0, Middle Channel



Normal Condition Power Control Level 15, Middle Channel

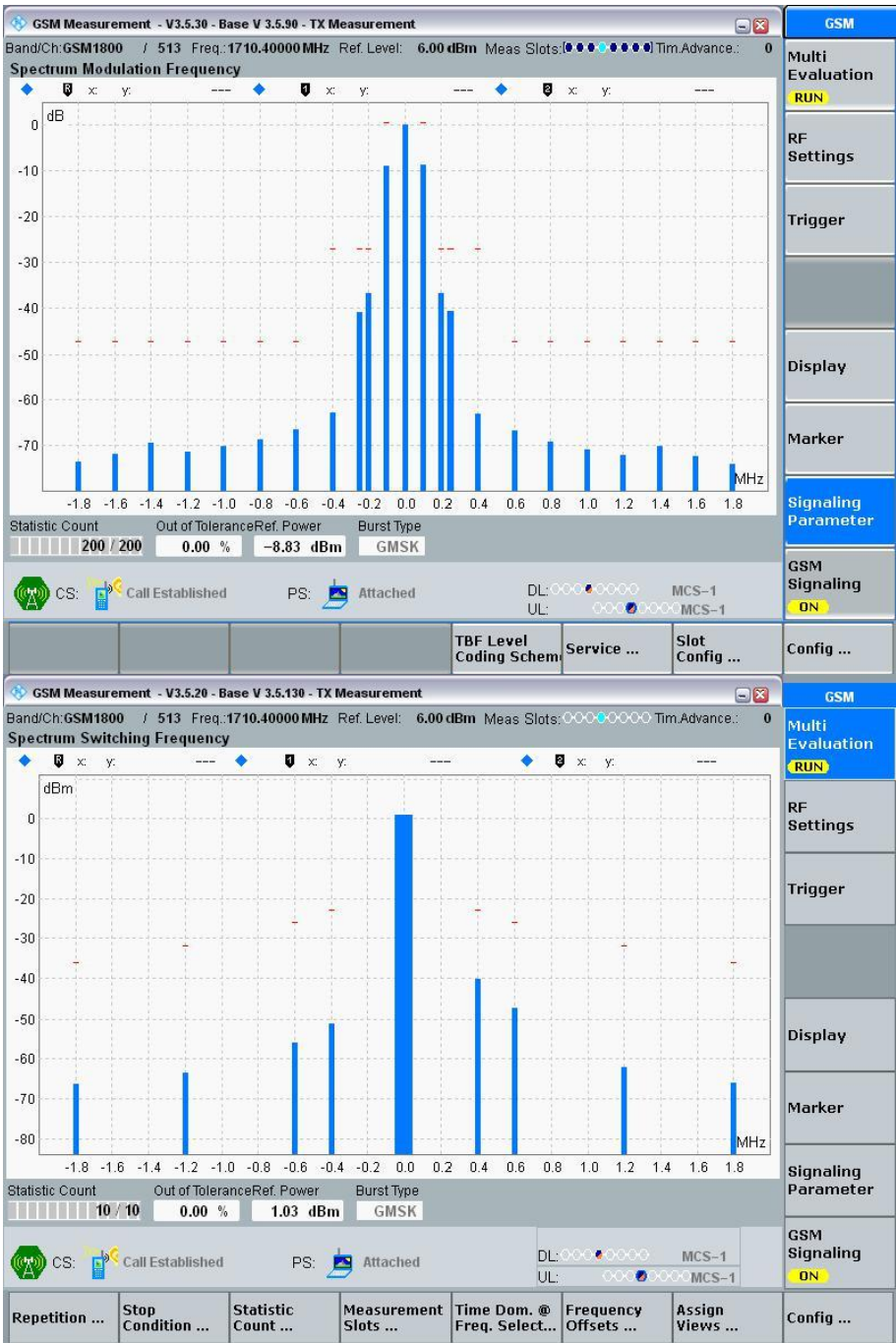


Normal Condition Power Control Level 0, Low Channel





Normal Condition Power Control Level 15, Low Channel



**Spurious Emissions in the MS receive bands-GSM:****For GSM900 Band (Middle Channel)**

Frequency range (MHz)	Frequency (MHz)	Spurious Emissions		
		Level (dBm)	Limit (dBm)	Results
925-935	929.70	-75.92	-67	Pass
935-960	944.78	-80.47	-79	Pass
	956.03	-82.19	-79	Pass

**For DCS1800 Band (Middle channel)**

Frequency range (MHz)	Frequency (MHz)	Spurious Emissions		
		Level (dBm)	Limit (dBm)	Results
1805-1880	1823.67	-76.12	-71	Pass
	1838.26	-73.82	-71	Pass
	1845.94	-72.74	-71	Pass
	1865.06	-76.18	-71	Pass

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

## §4.2.10 - TRANSMITTER OUTPUT POWER IN GPRS MULTISLOT CONFIGURATION

### Applicable Standard

According to EN 301 511 V12.5.1 (2017-03), 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  $\pm 2$  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  $\pm 2,5$  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  $\pm 3$  dB,  $\pm 4$  dB or  $\pm 5$  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  $\pm 4$  dB,  $\pm 5$  dB or  $\pm 6$  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  $2 \pm 1,5$  dB ( $1 \pm 1$  dB 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 be 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\_TXPWR\_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.

## 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 re-selection procedure the Power Level indicated in the PS H500S 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 PS H500S

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.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition					Result
GSM 900	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
DCS 1800	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass

Normal Condition Test Data as below:

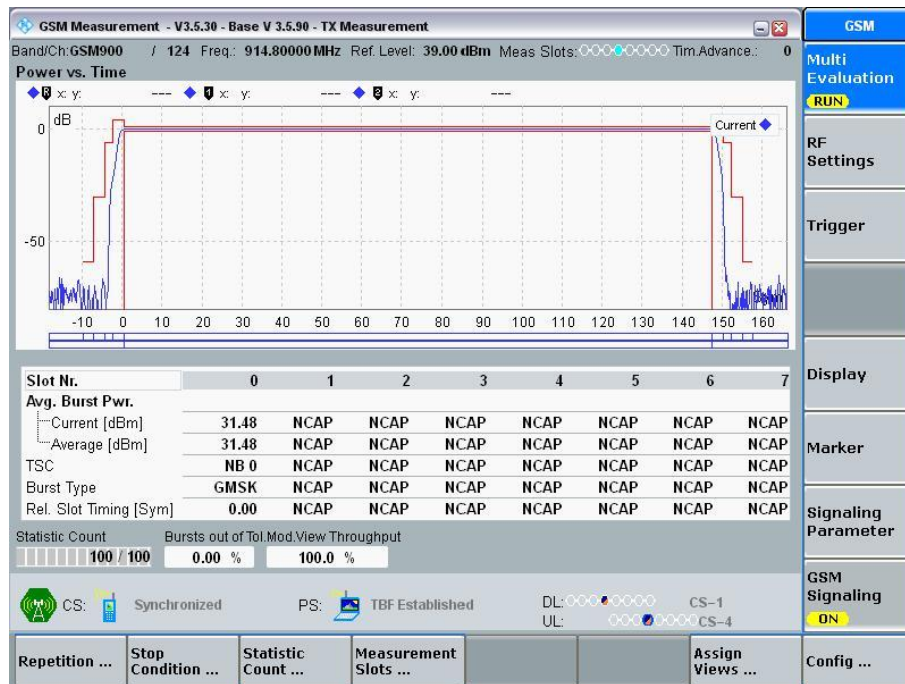
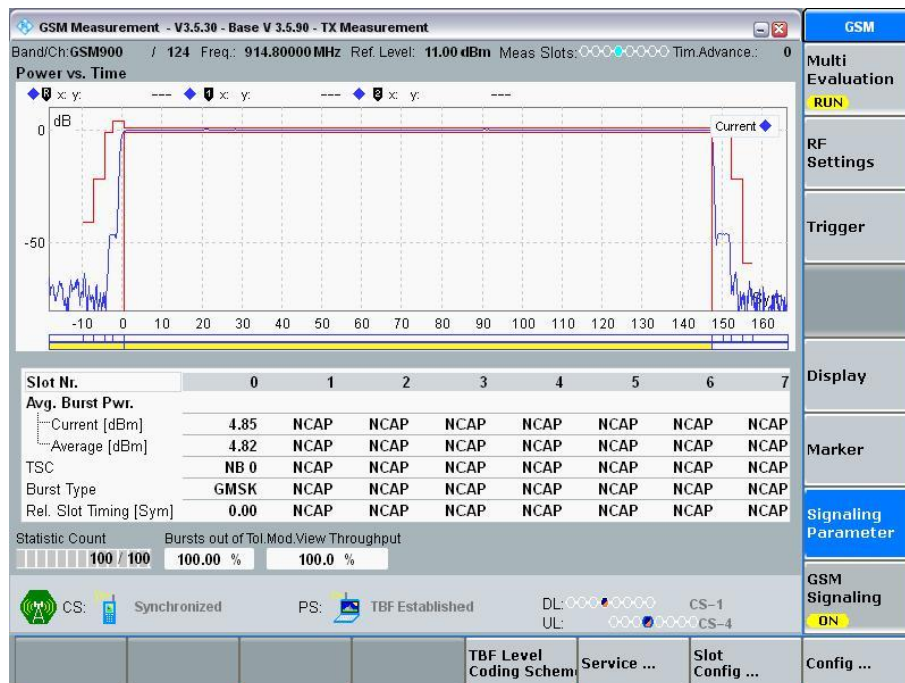
### GSM900 Output Power in GPRS

Power Control Level	Output power (dBm)			Result
	Low Channel	Middle Channel	High Channel	
1 uplink slot				Pass
3	31.59	31.58	31.48	
4	29.86	29.94	29.74	
5	27.64	27.85	27.80	
6	25.58	25.20	25.77	
7	23.71	23.79	23.72	
8	22.03	21.65	21.55	
9	19.12	19.97	19.87	
10	17.93	17.25	17.92	
11	15.94	15.10	15.33	
12	13.62	13.71	13.31	
13	11.64	11.20	11.69	
14	9.37	9.75	9.33	
15	7.69	7.68	7.34	
16	5.48	5.55	5.47	
17	3.95	3.95	4.82	
2 uplink slots				
3	29.49	29.66	29.46	
17	4.09	4.17	4.02	
3 uplink slots				
3	27.56	27.63	27.55	
17	4.40	4.41	4.37	
4 uplink slots				
3	25.57	25.54	25.62	
17	4.62	4.46	4.59	

## Normal Condition:

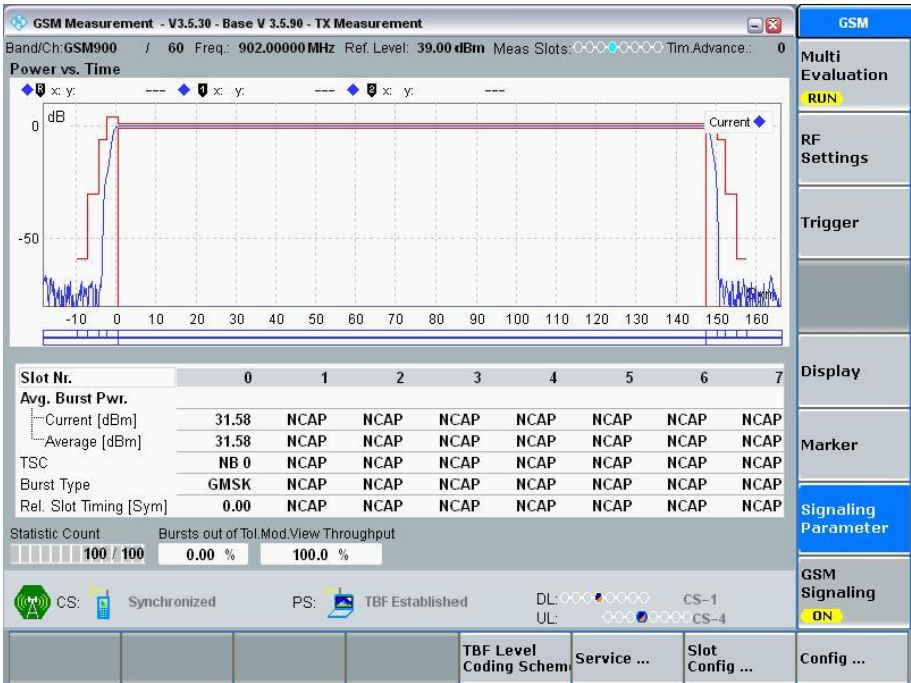
GSM900:

## 1 Uplink Slot

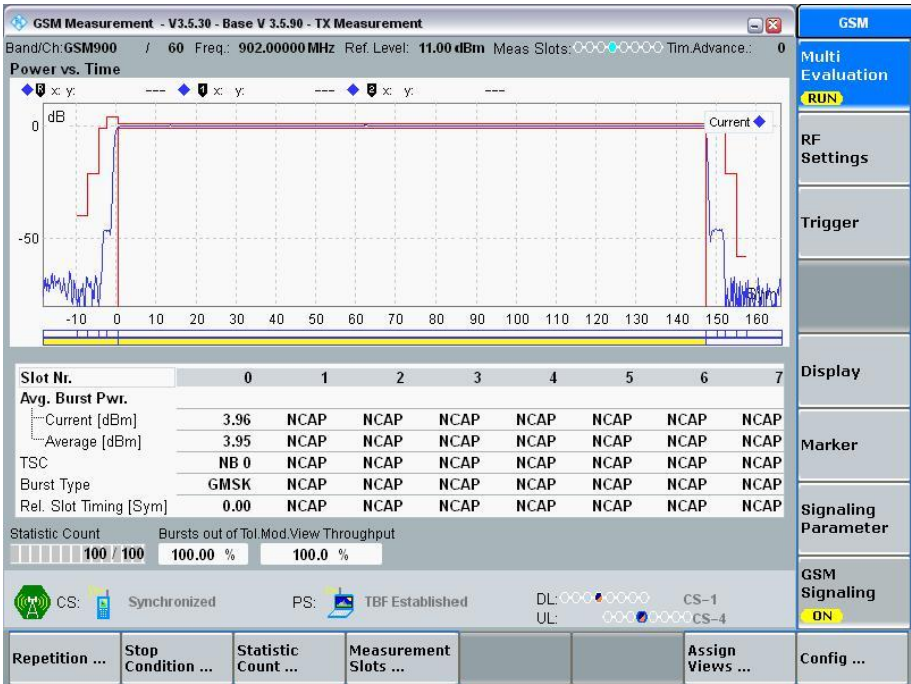
Normal Condition ( $\gamma=3$ ), High ChannelNormal Condition ( $\gamma=17$ ), High Channel



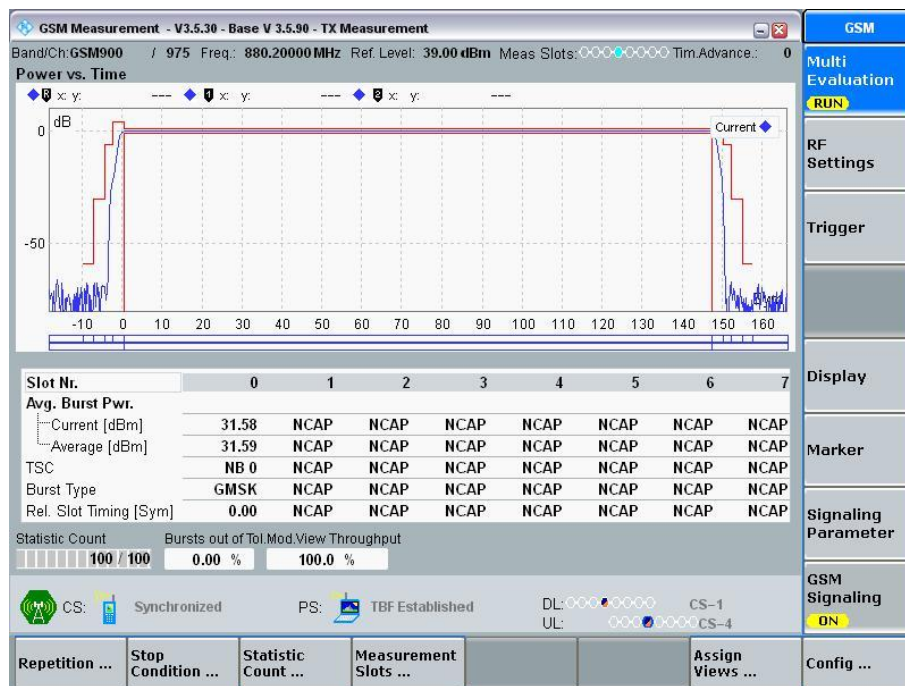
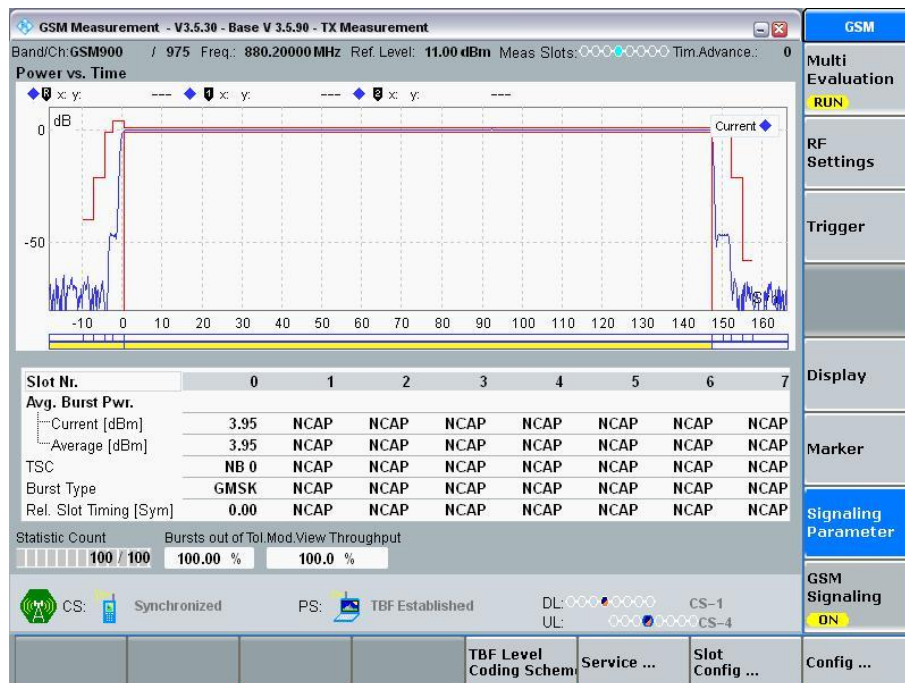
Normal Condition ( $\gamma=3$ ), Middle Channel



Normal Condition ( $\gamma=17$ ), Middle Channel

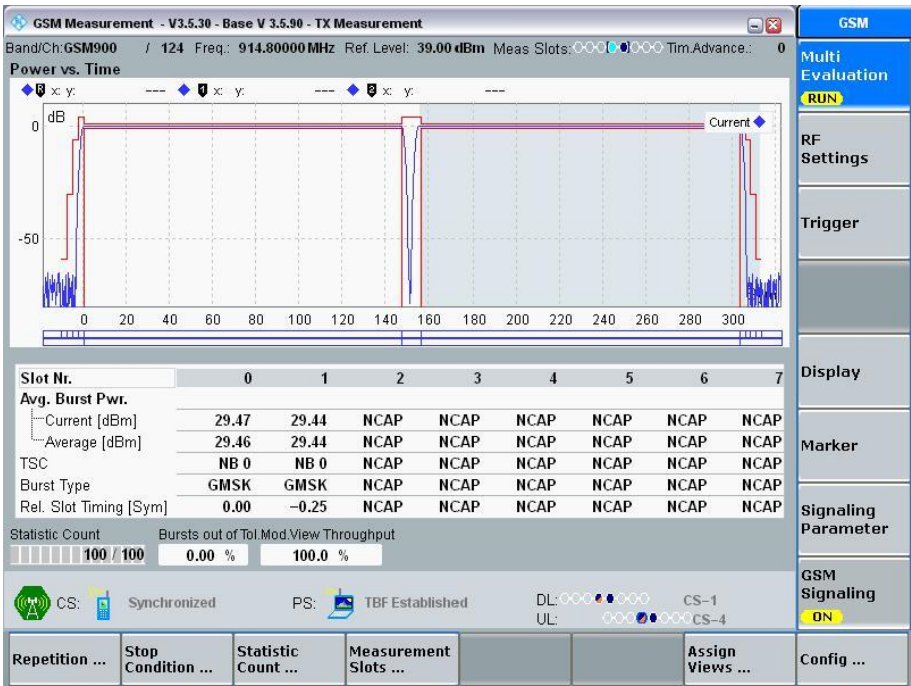




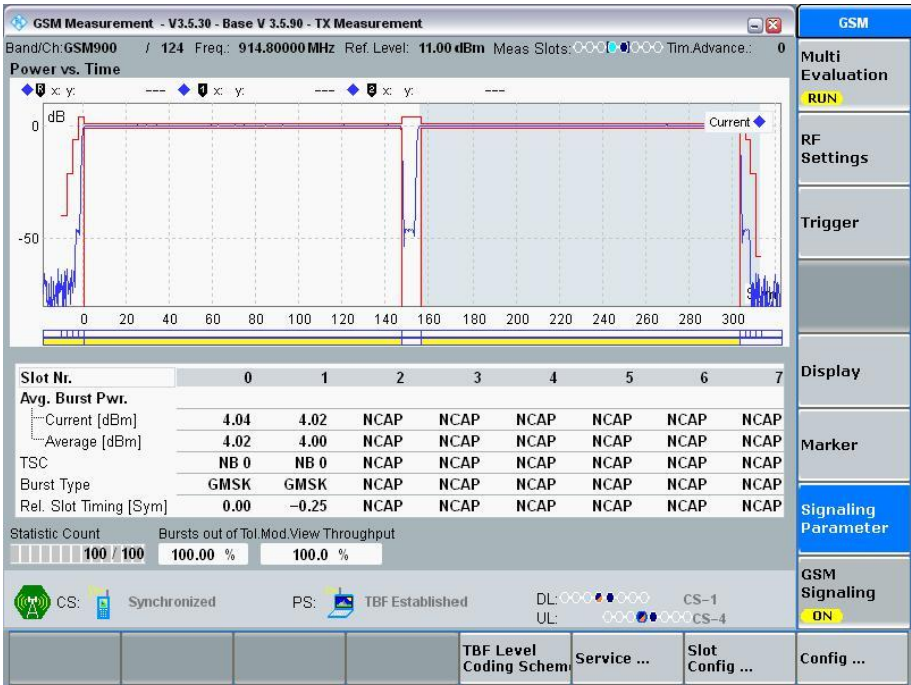
Normal Condition ( $\gamma=3$ ), Low ChannelNormal Condition ( $\gamma=17$ ), Low Channel

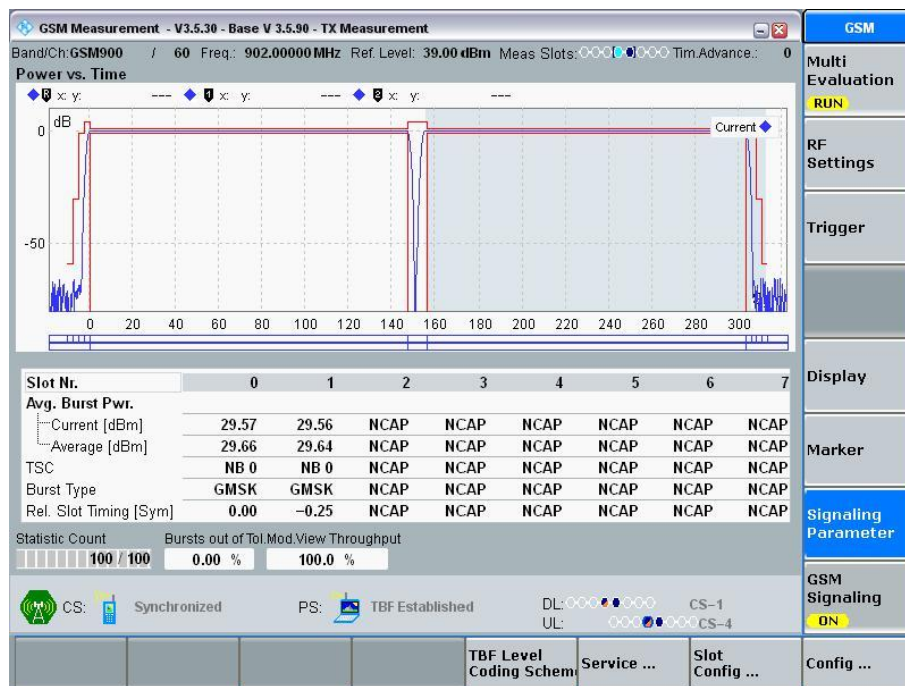
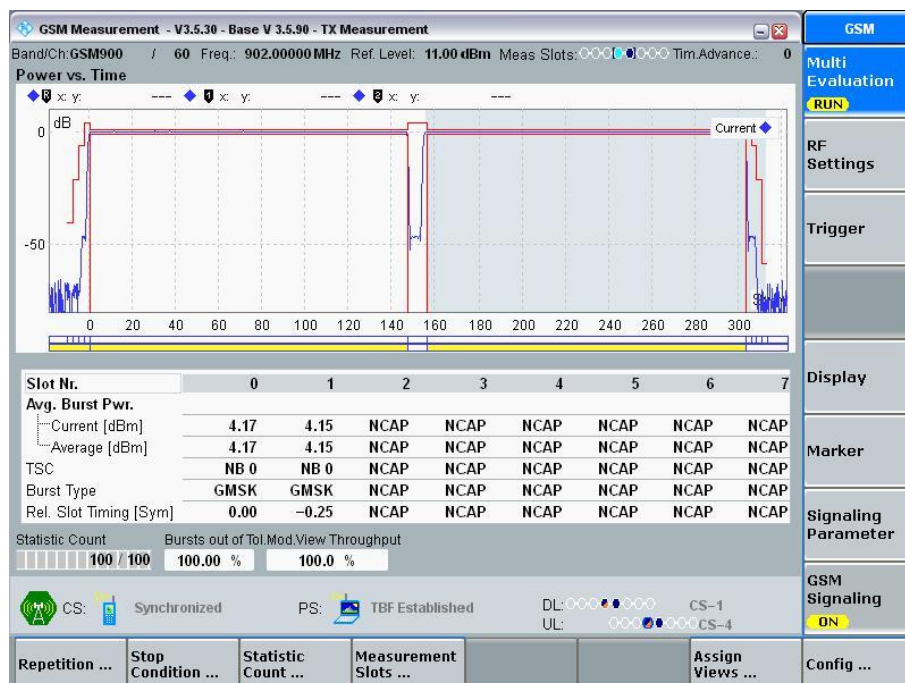
2 Uplink Slots

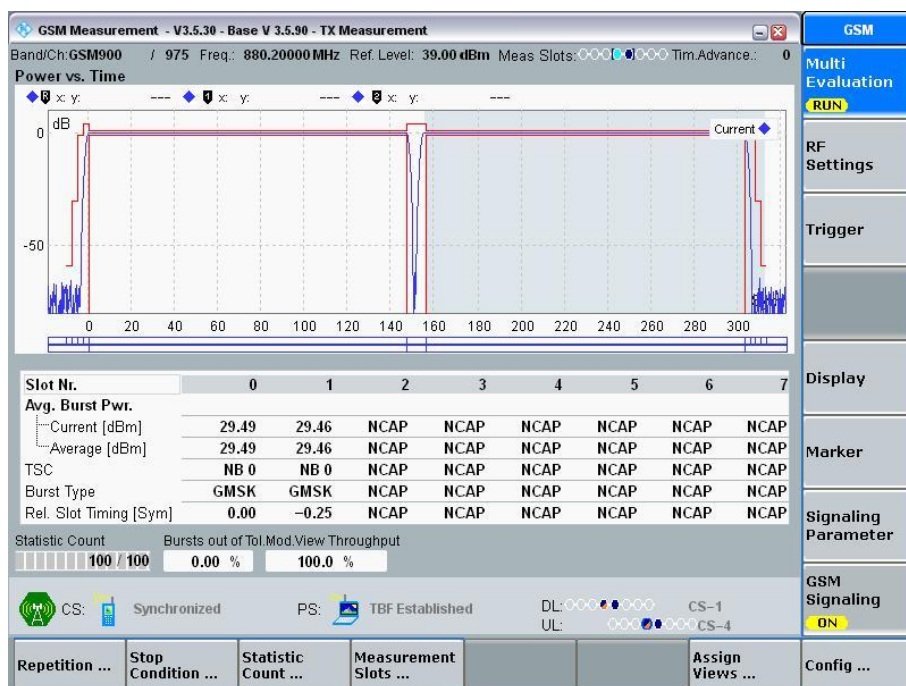
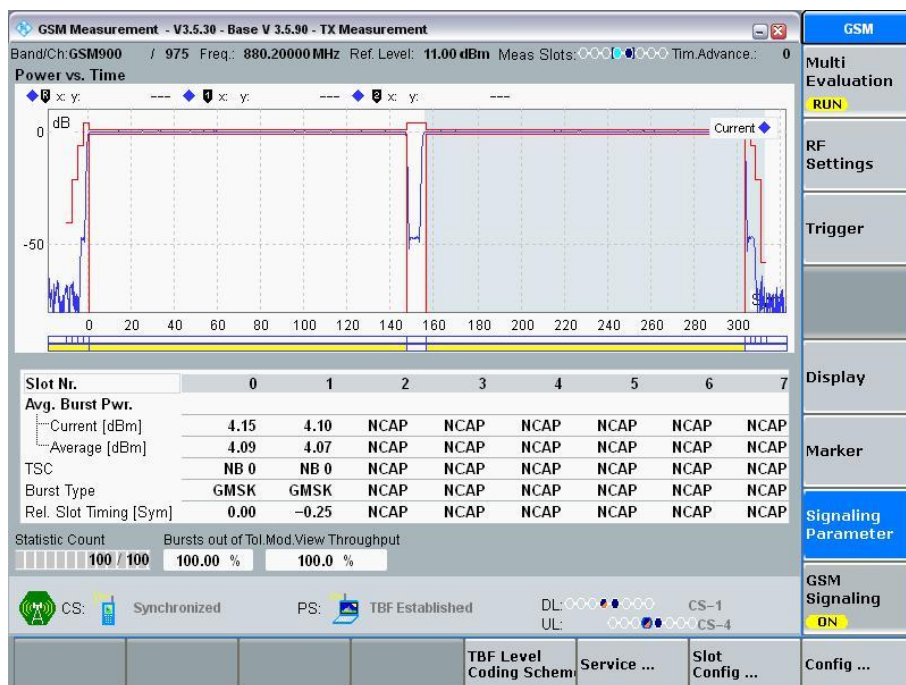
Normal Condition ( $\gamma=3$ ), High Channel



Normal Condition ( $\gamma=17$ ), High Channel



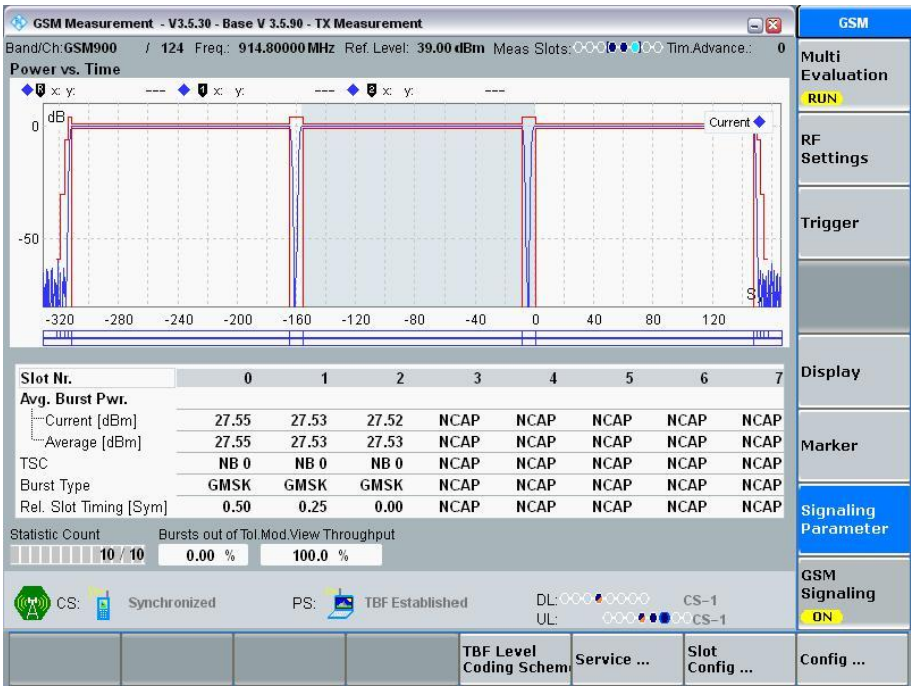
Normal Condition ( $\gamma=3$ ), Middle ChannelNormal Condition ( $\gamma=17$ ), Middle Channel

Normal Condition ( $\gamma=3$ ), Low ChannelNormal Condition ( $\gamma=17$ ), Low Channel

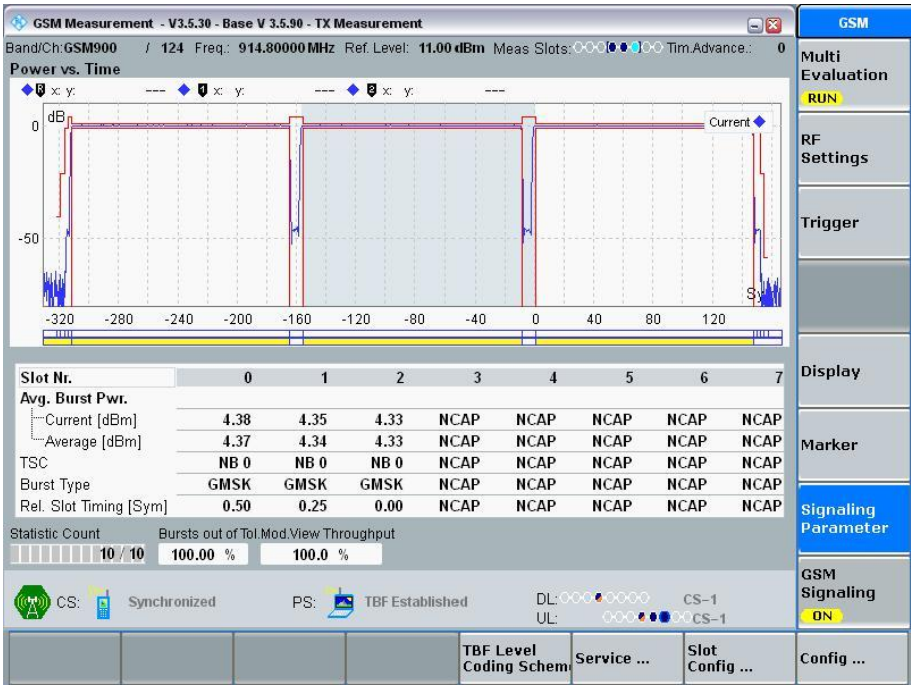


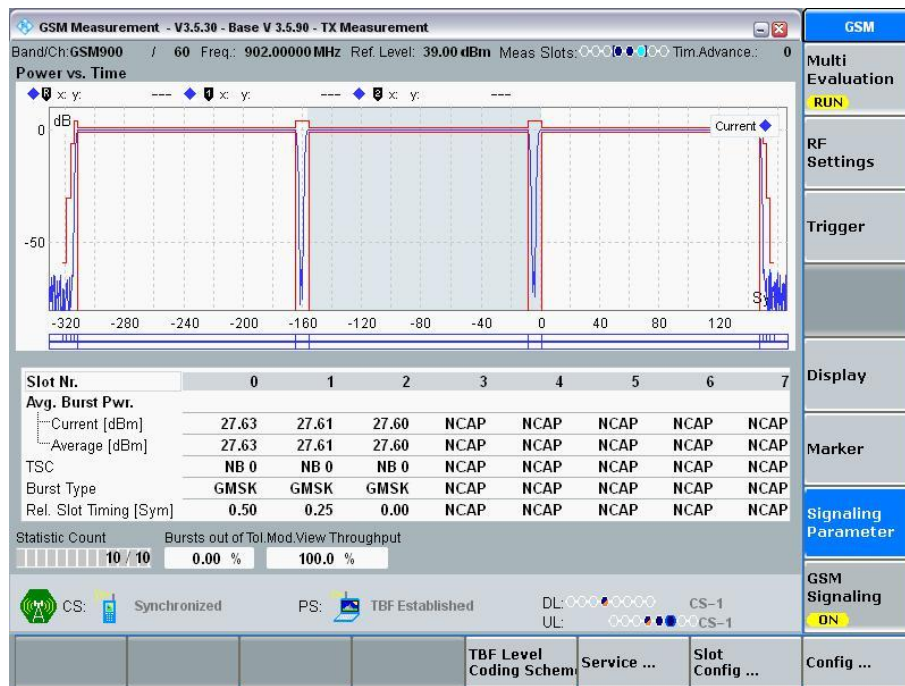
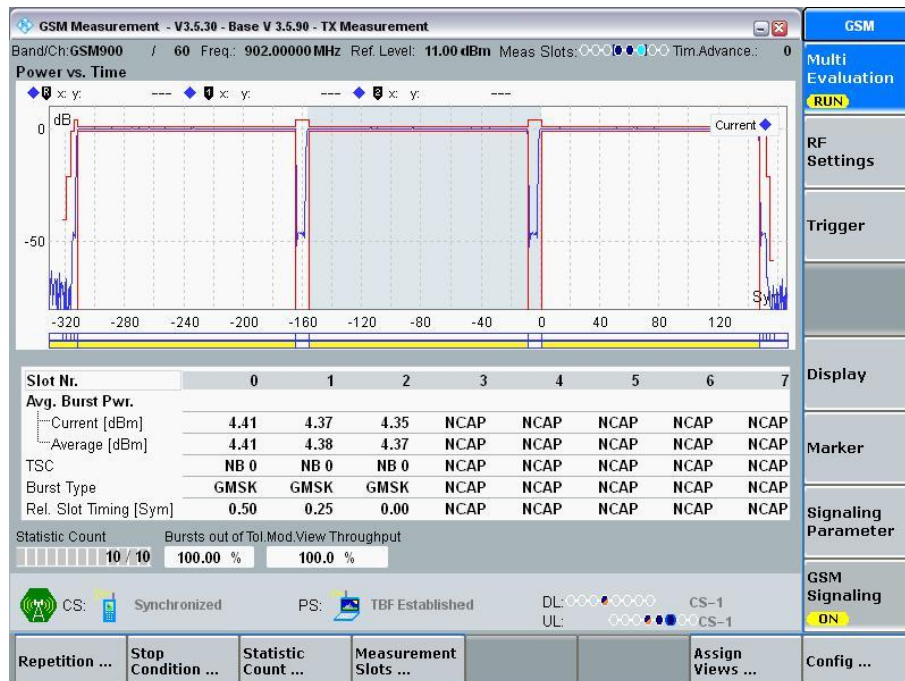
3 Uplink Slots

Normal Condition ( $\gamma=3$ ), High Channel

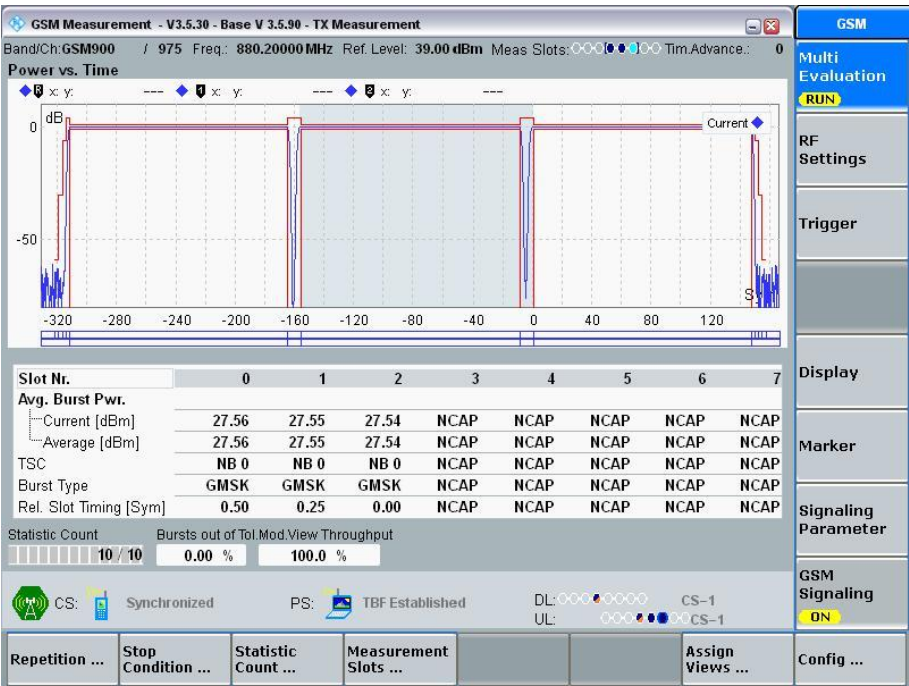


Normal Condition ( $\gamma=17$ ), High Channel

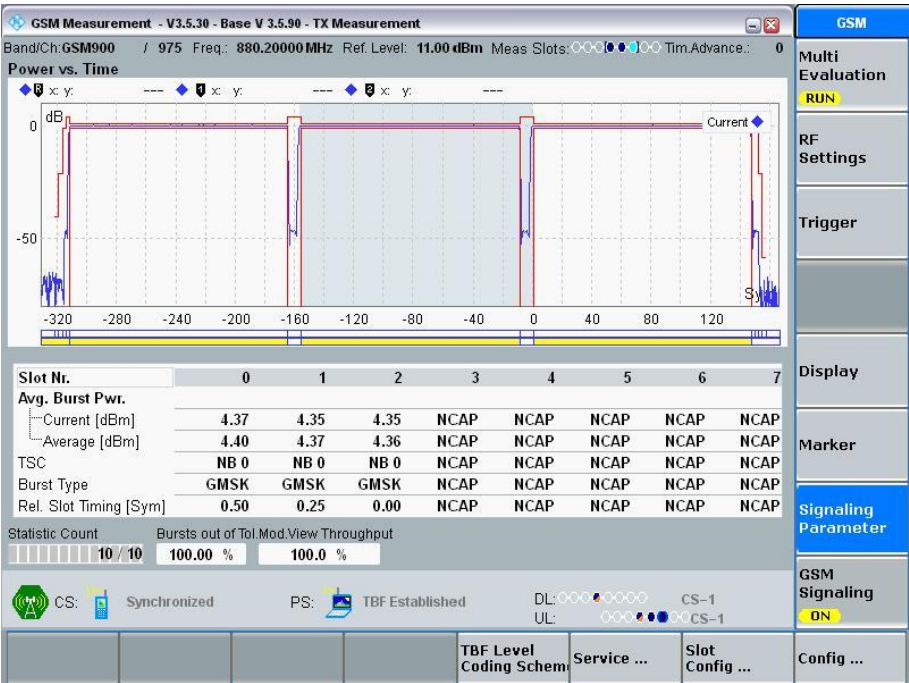


Normal Condition ( $\gamma=3$ ), Middle ChannelNormal Condition ( $\gamma=17$ ), Middle Channel

Normal Condition ( $\gamma=3$ ), Low Channel

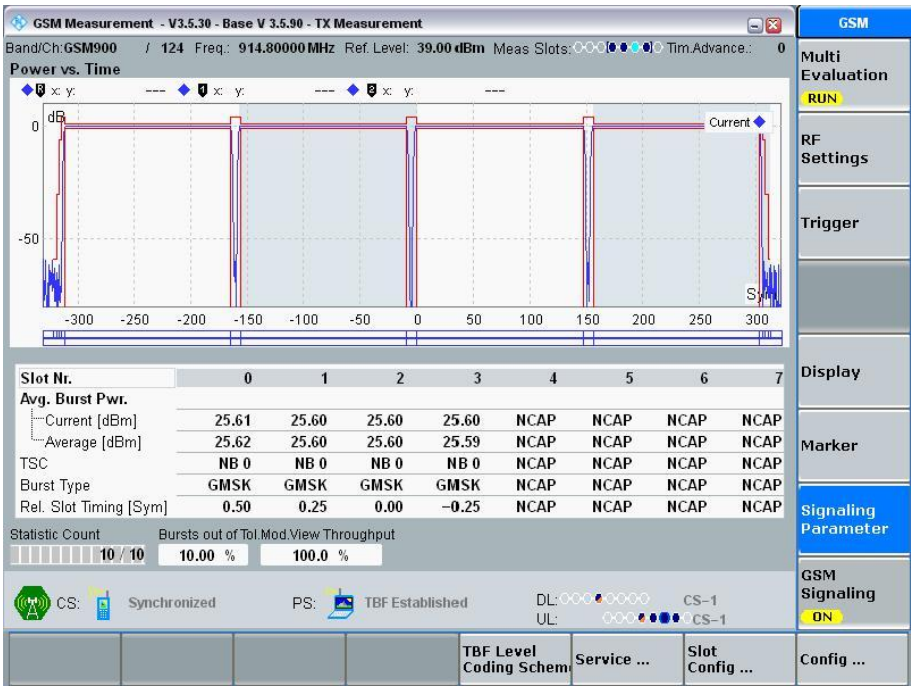


Normal Condition ( $\gamma=17$ ), Low Channel

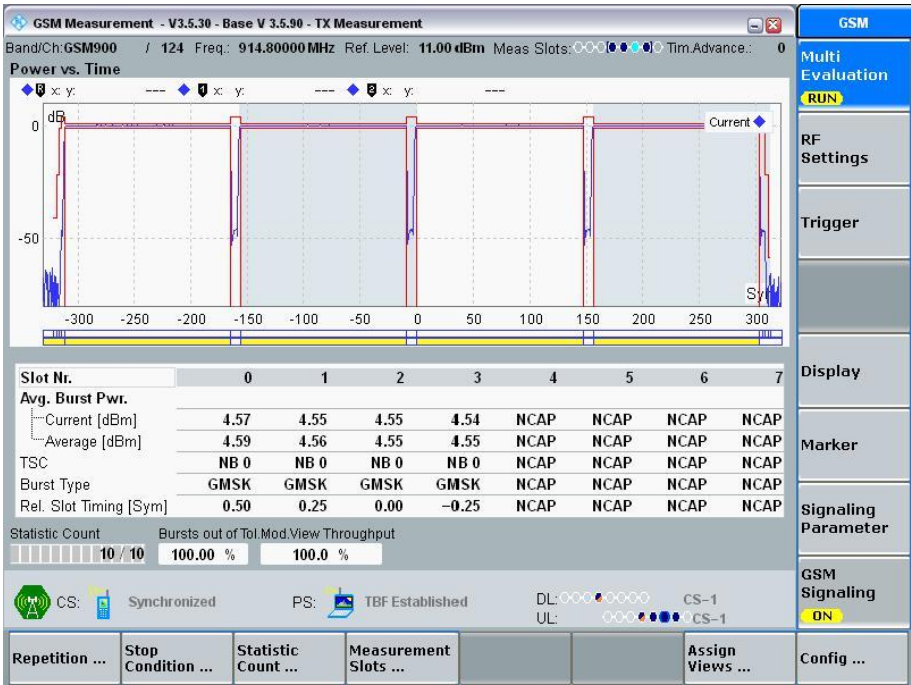


4 Uplink Slots

Normal Condition ( $\gamma=3$ ), High Channel

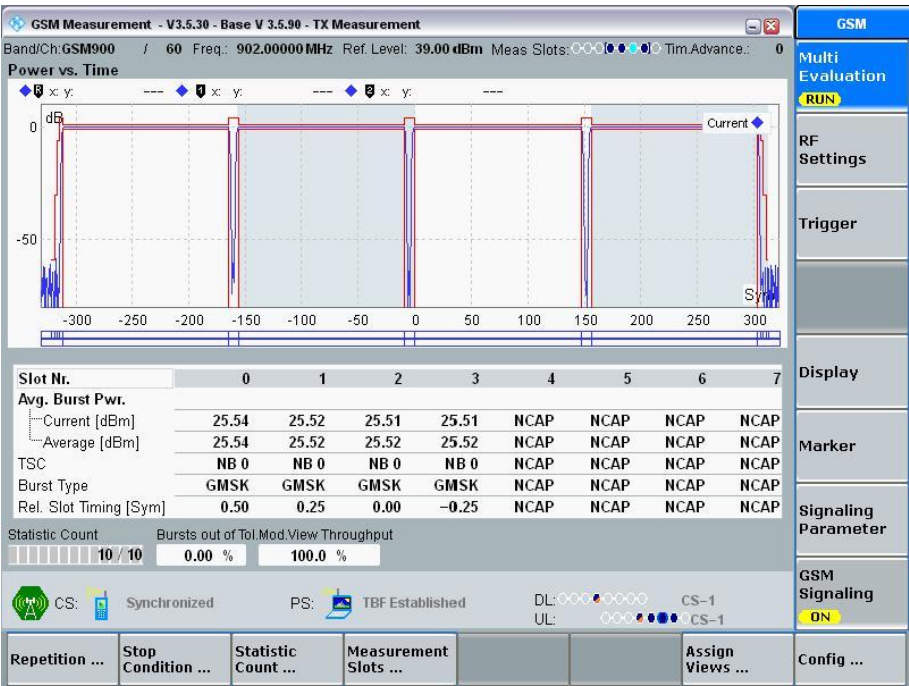


Normal Condition ( $\gamma=17$ ), High Channel

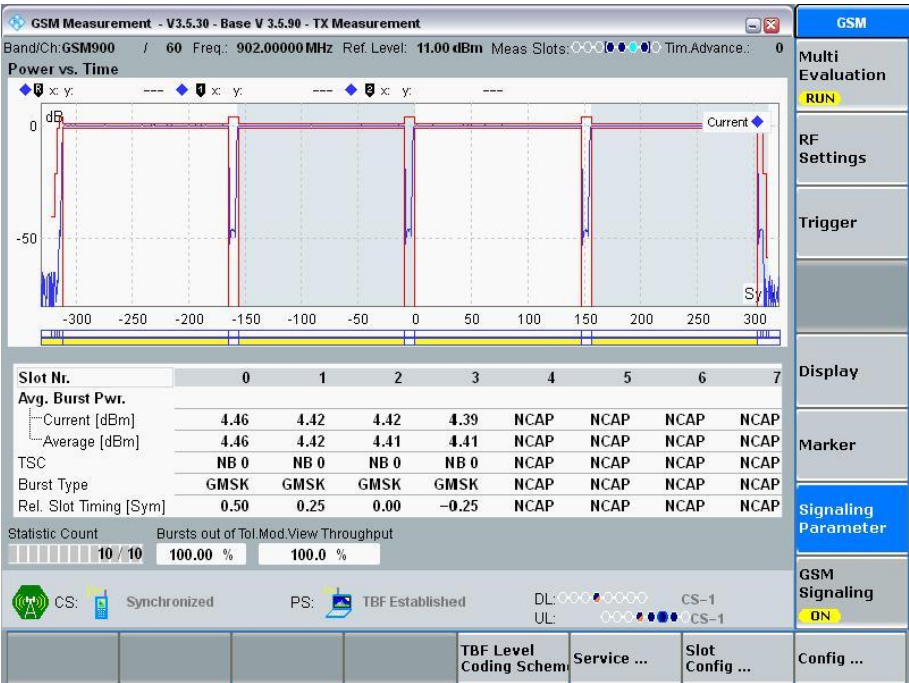




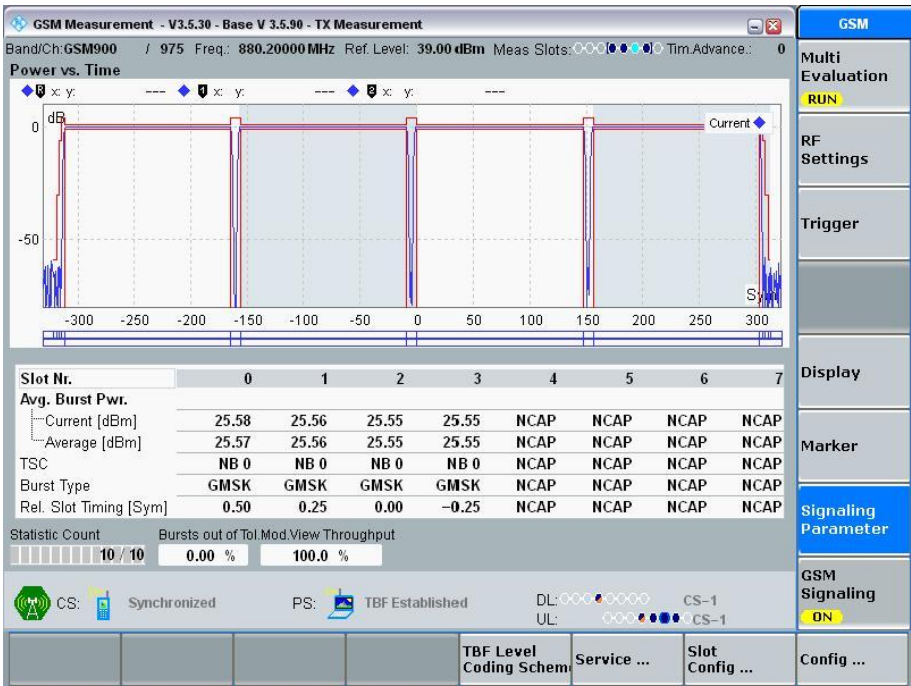
Normal Condition ( $\gamma=3$ ), Middle Channel



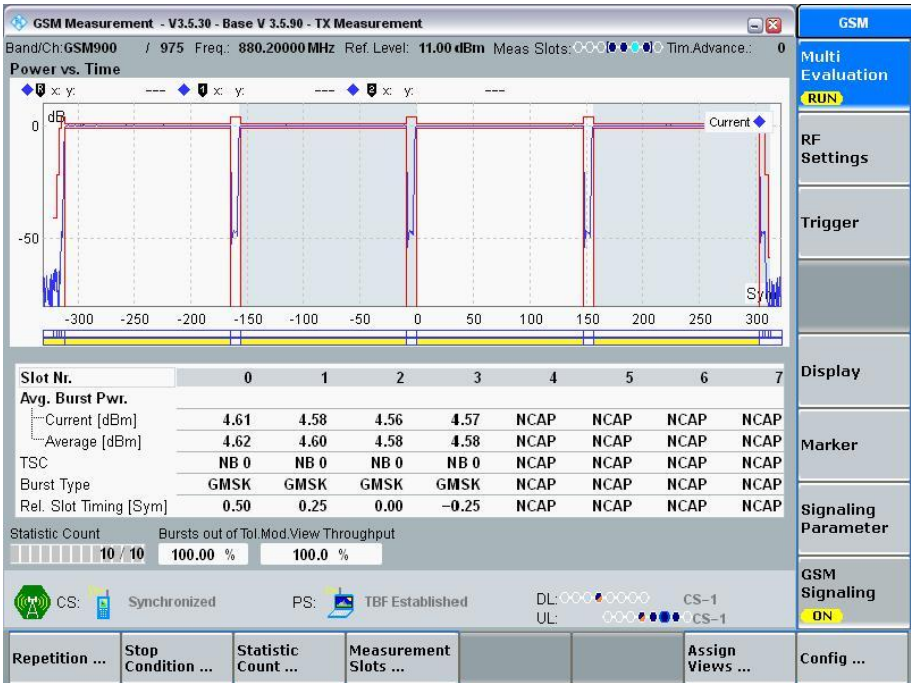
Normal Condition ( $\gamma=17$ ), Middle Channel



Normal Condition ( $\gamma=3$ ), Low Channel



Normal Condition ( $\gamma=17$ ), Low Channel



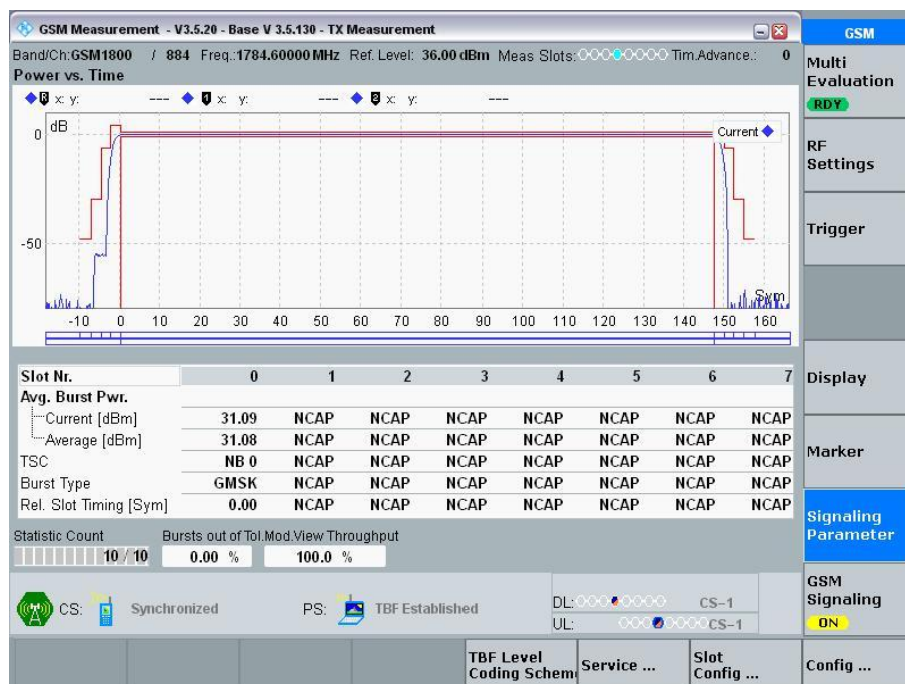
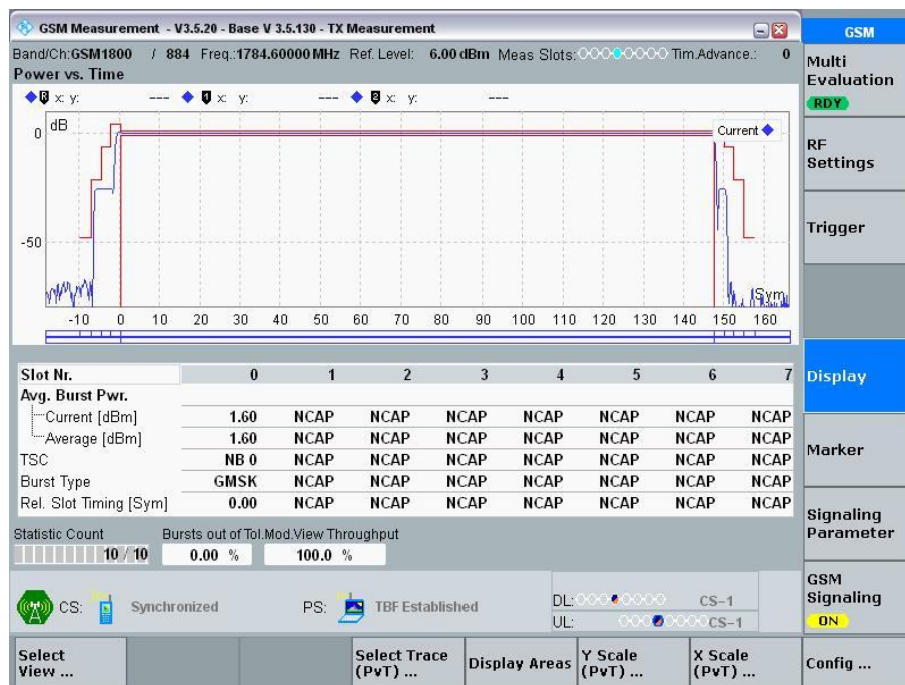
**DCS1800 Output Power in GPRS**

Power Control Level	Output power (dBm)			Result
	Low Channel	Middle Channel	High Channel	
1 uplink slot				Pass
3	31.16	31.12	31.08	
4	29.34	29.33	29.05	
5	27.58	27.56	27.49	
6	25.93	25.71	25.69	
7	23.59	23.80	23.83	
8	20.99	20.63	20.56	
9	19.53	19.35	19.36	
10	17.47	17.22	17.20	
11	15.88	15.71	15.30	
12	13.09	13.44	13.91	
13	10.79	10.43	10.92	
14	8.39	8.52	8.13	
15	6.18	6.13	6.09	
16	4.22	3.86	4.06	
17	2.91	2.42	2.57	
18	1.98	1.13	1.60	
2 uplink slots				
3	28.72	28.95	28.72	
18	1.03	1.19	1.02	
3 uplink slots				
3	27.09	27.39	27.18	
18	0.97	1.20	1.00	
4 uplink slots				
3	25.06	25.22	25.18	
18	1.02	1.17	1.08	

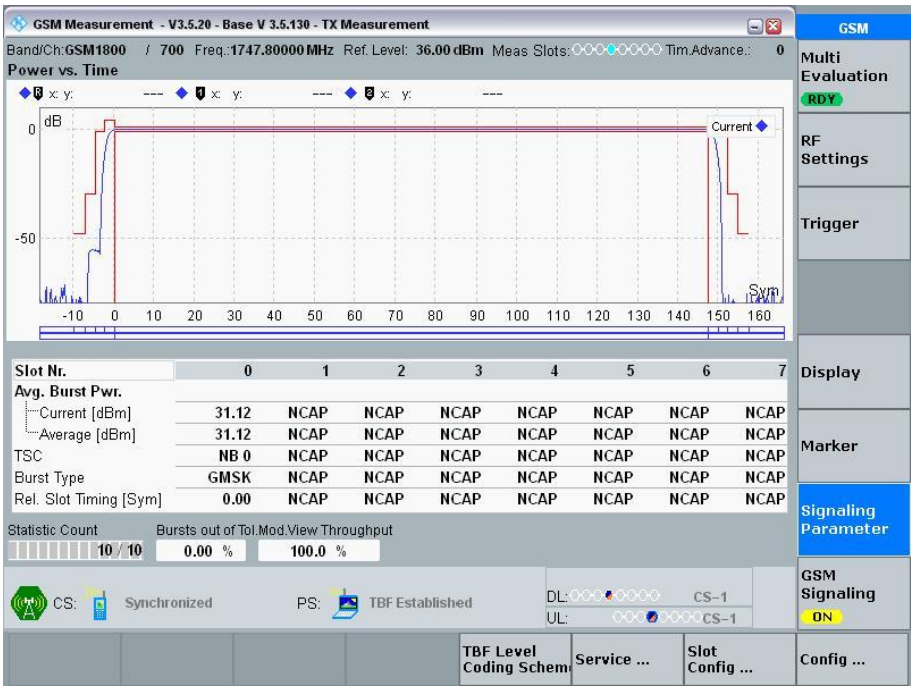
DCS1800:

Normal Condition:

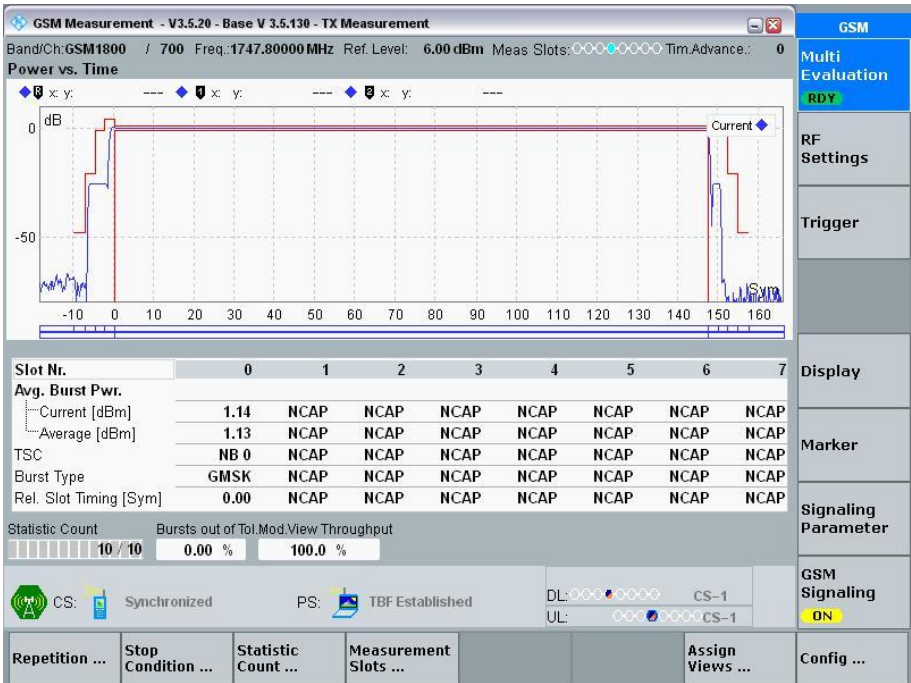
1 Uplink Slot

Normal Condition ( $\gamma=3$ ), High ChannelNormal Condition ( $\gamma=18$ ), High Channel

Normal Condition ( $\gamma=3$ ), Middle Channel

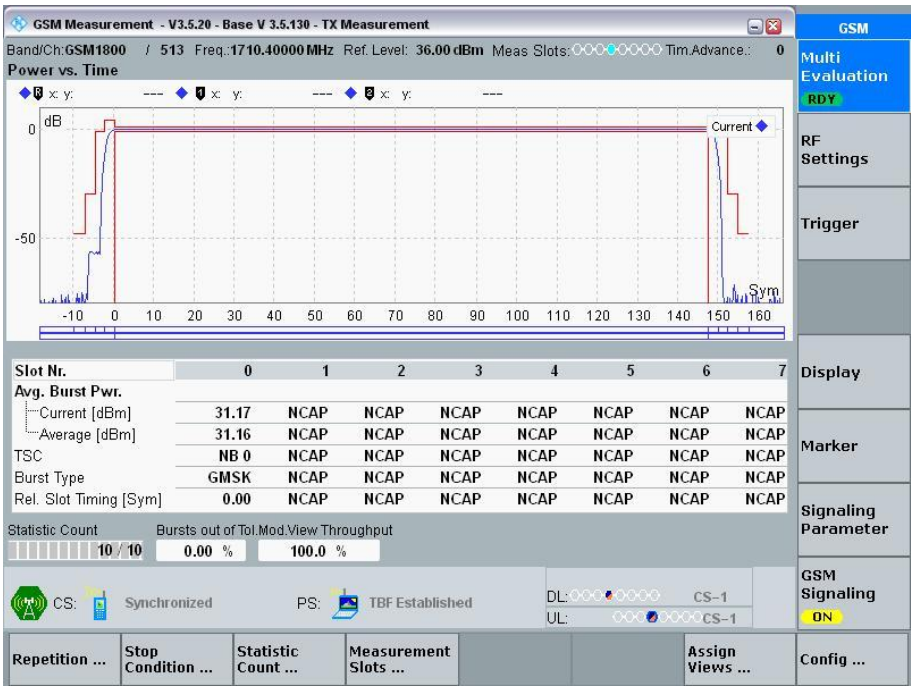


Normal Condition ( $\gamma=18$ ), Middle Channel

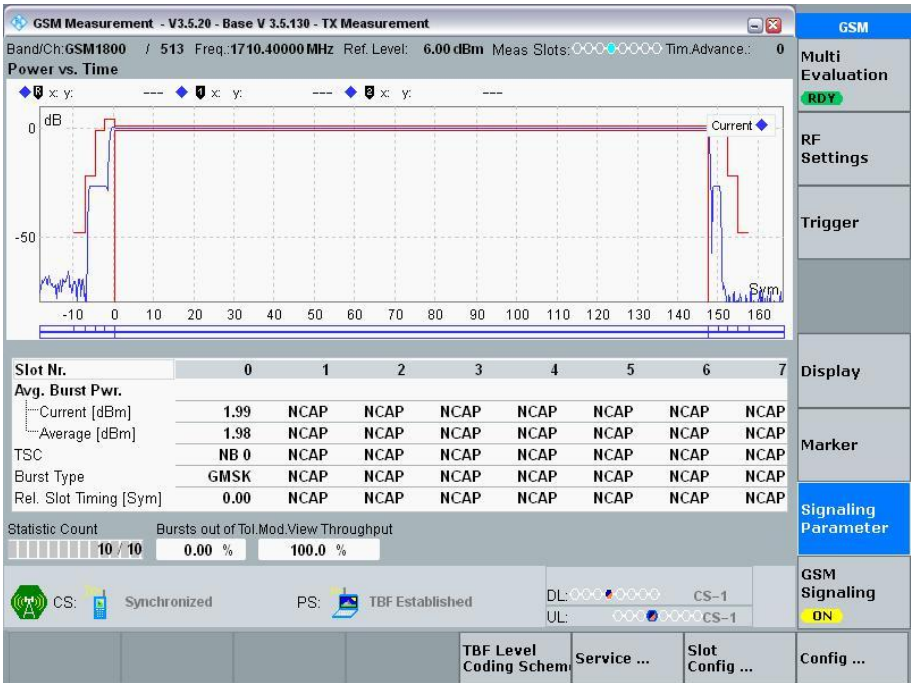




Normal Condition ( $\gamma=3$ ), Low Channel

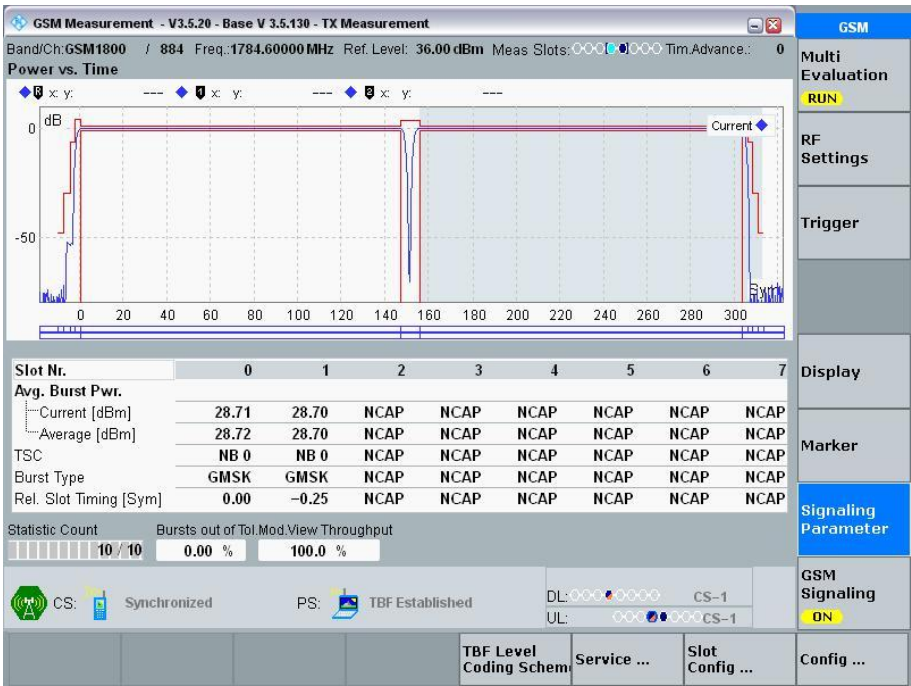


Normal Condition ( $\gamma=18$ ), Low Channel

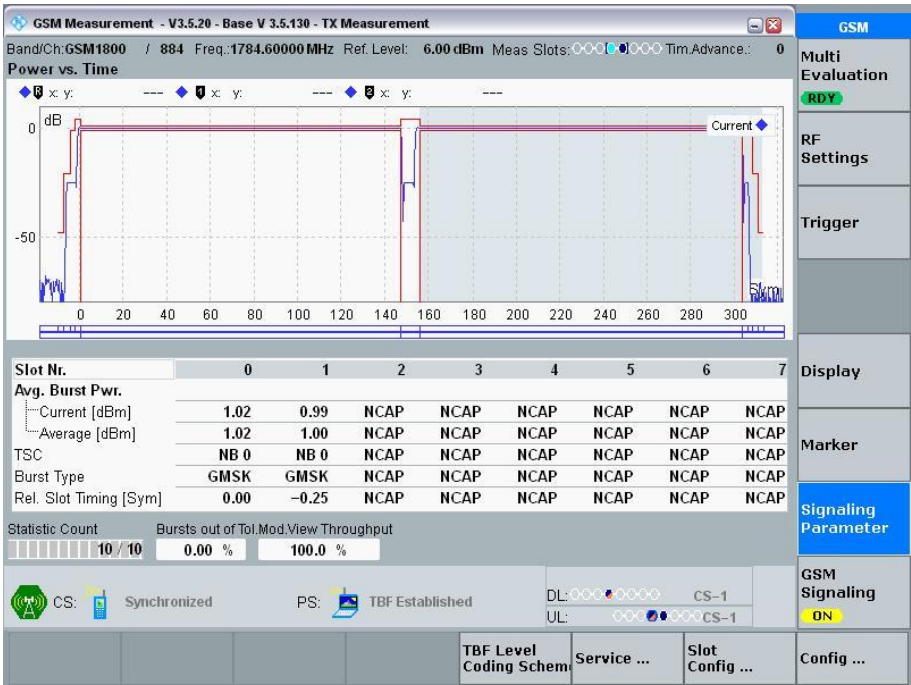


2 Uplink Slots

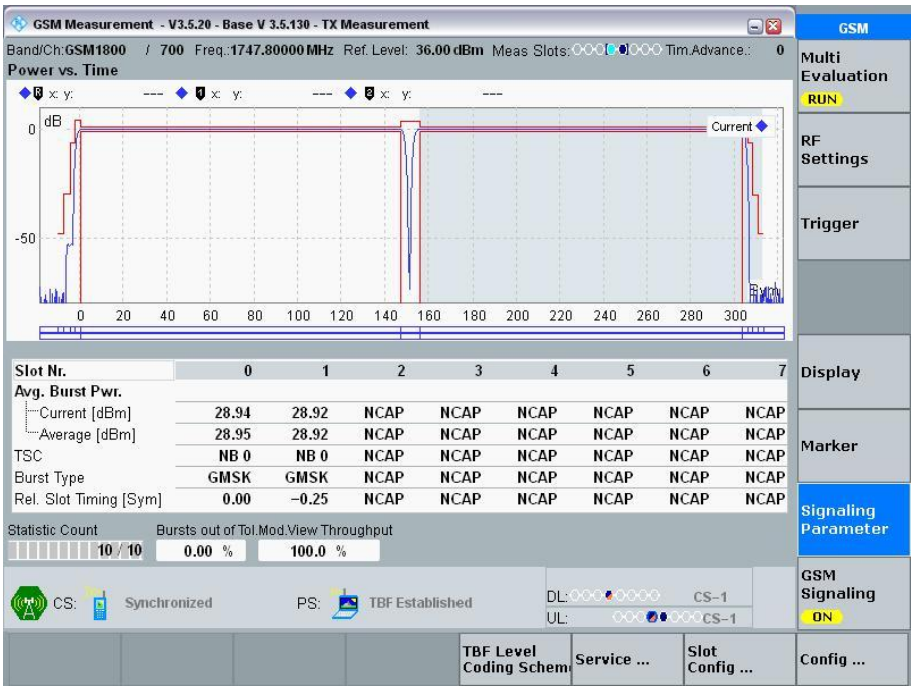
Normal Condition ( $\gamma=3$ ), High Channel



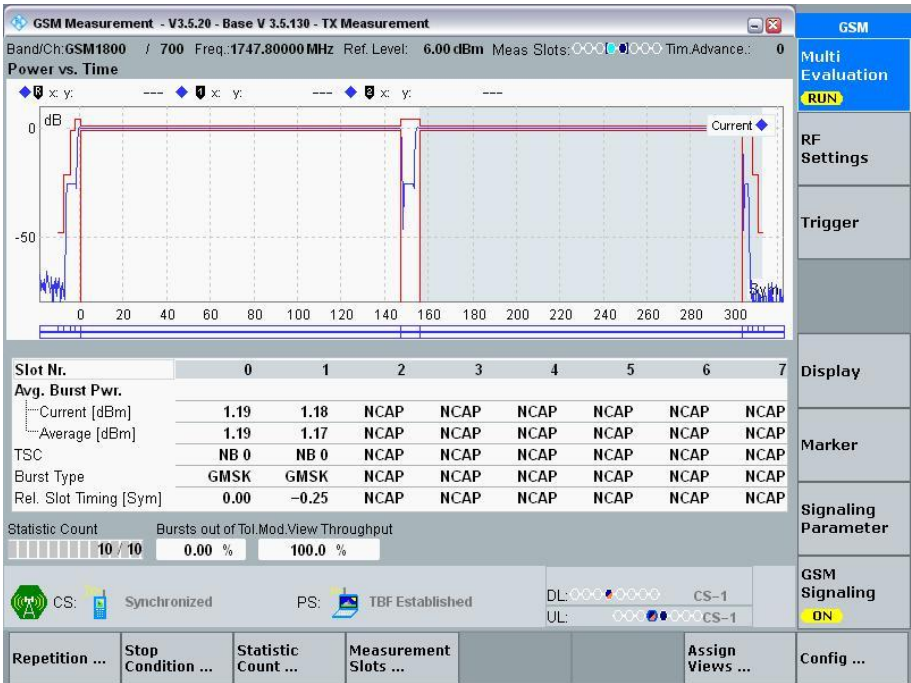
Normal Condition ( $\gamma=18$ ), High Channel



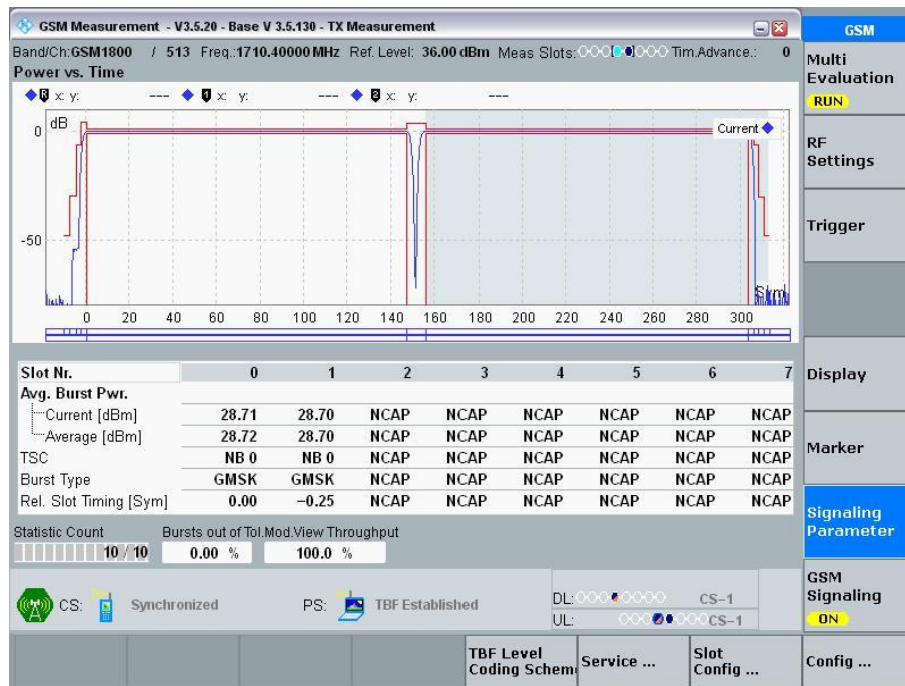
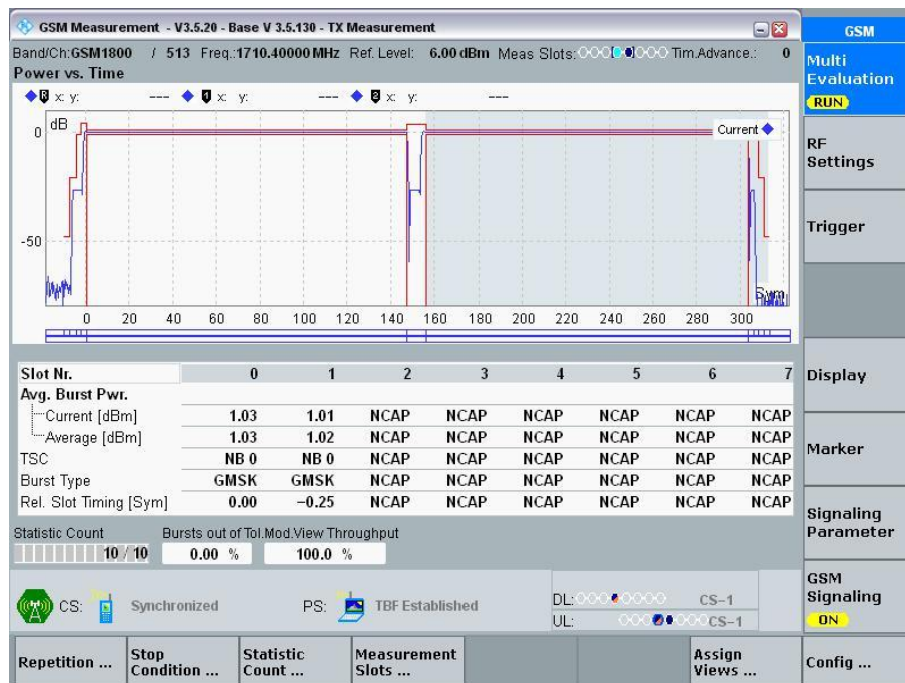
Normal Condition ( $\gamma=3$ ), Middle Channel



Normal Condition ( $\gamma=18$ ), Middle Channel

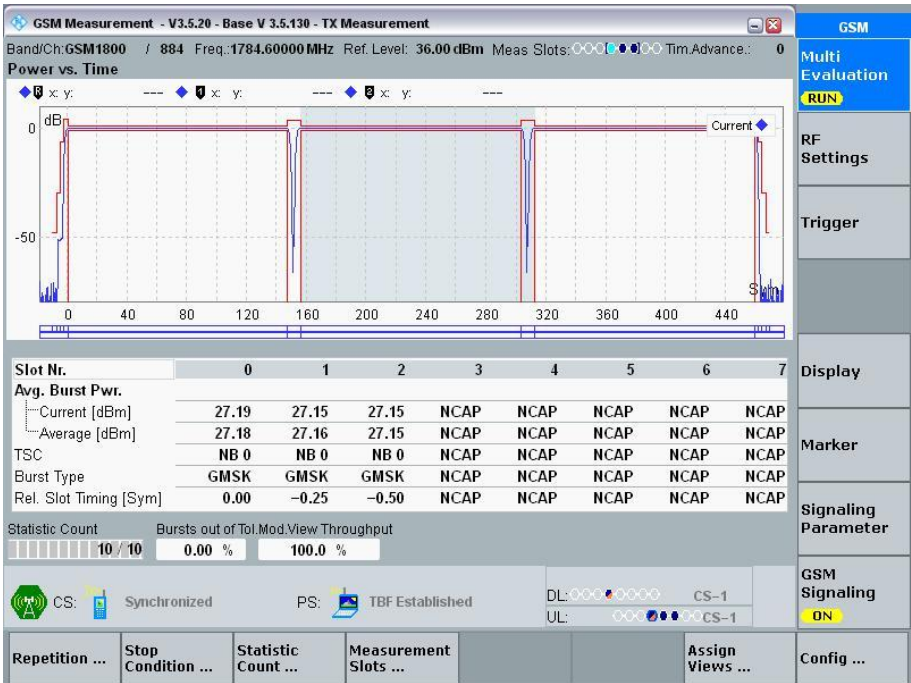




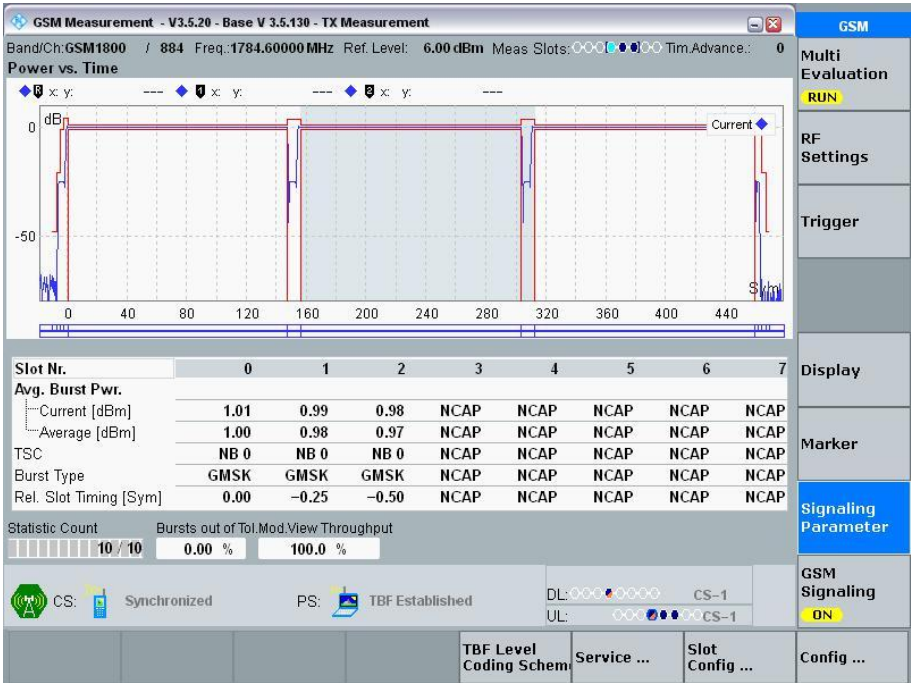
Normal Condition ( $\gamma=3$ ), Low ChannelNormal Condition ( $\gamma=18$ ), Low Channel

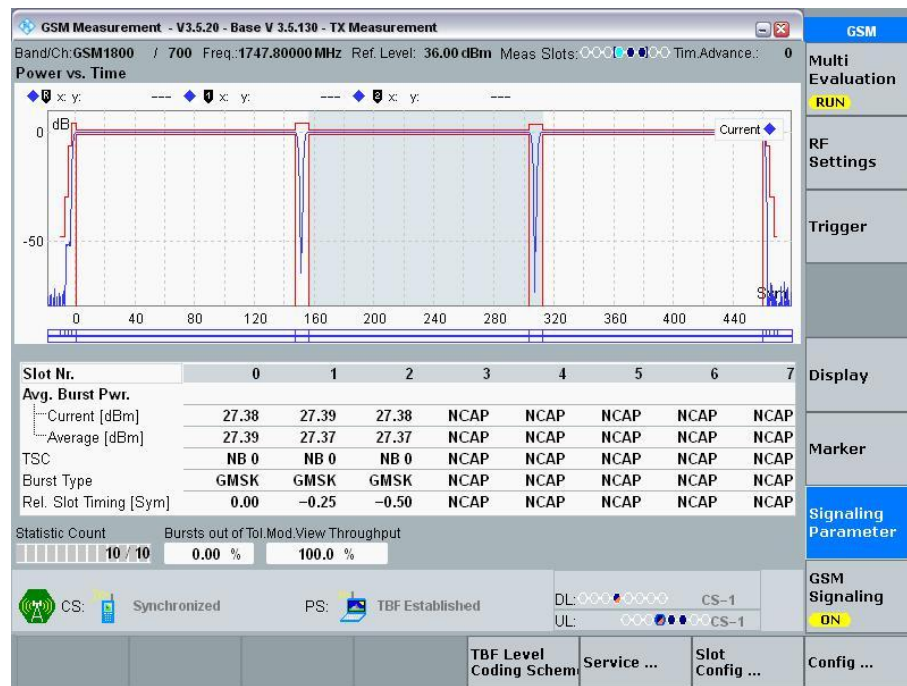
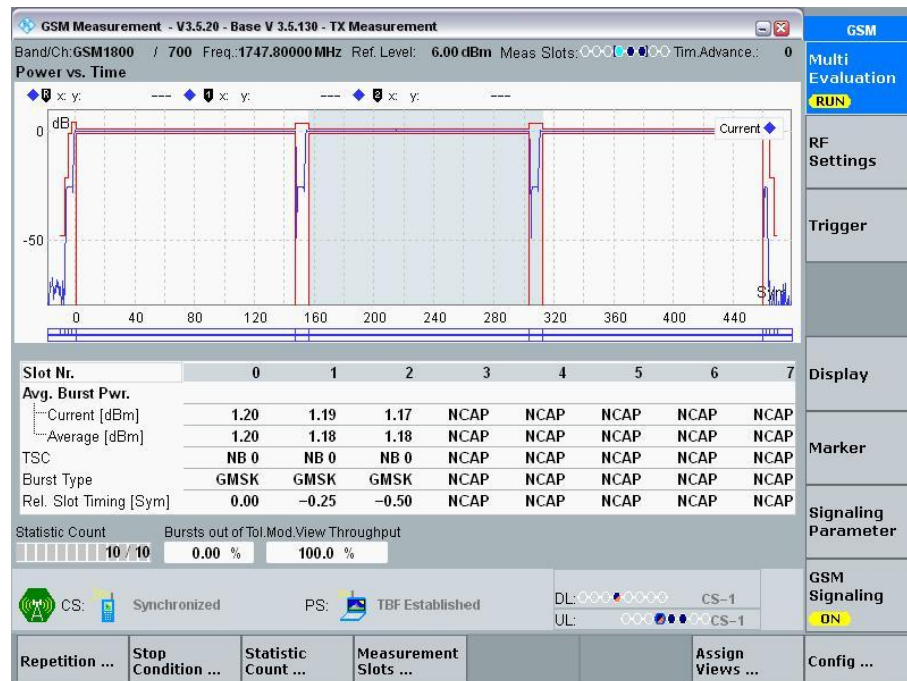
3 Uplink Slots

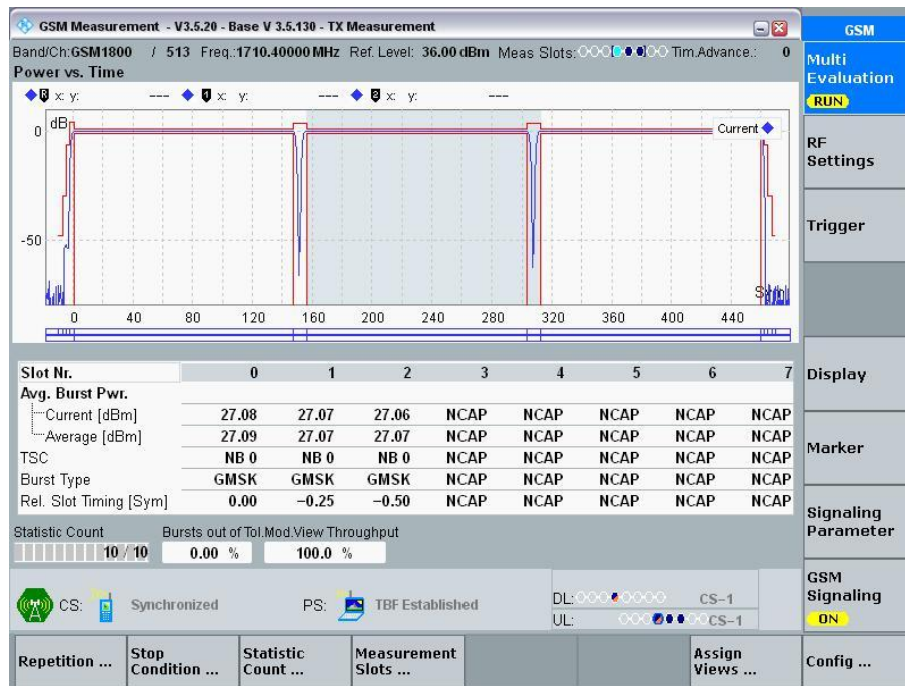
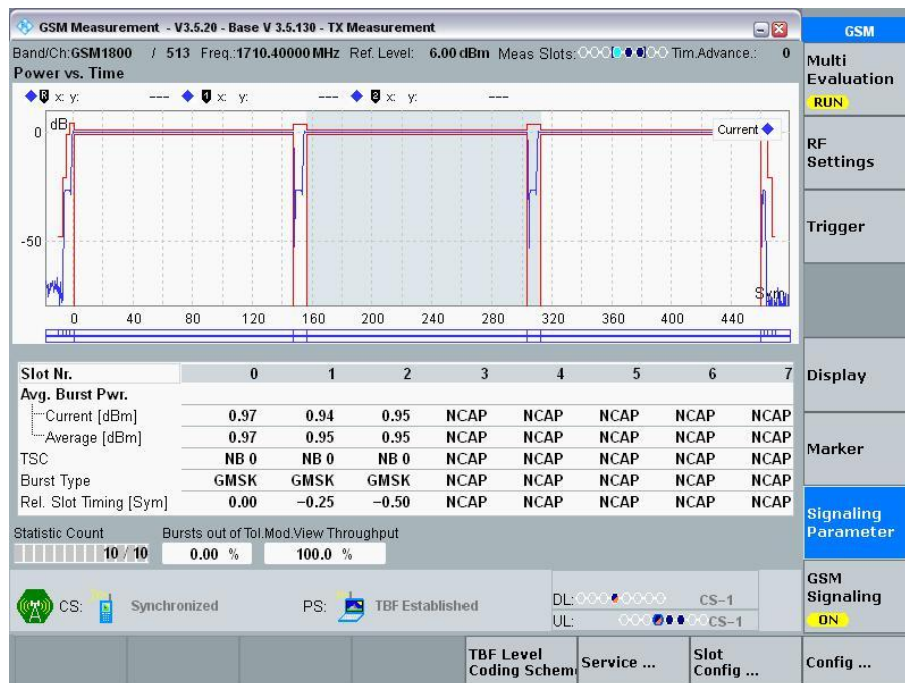
Normal Condition ( $\gamma=3$ ), High Channel



Normal Condition ( $\gamma=18$ ), High Channel



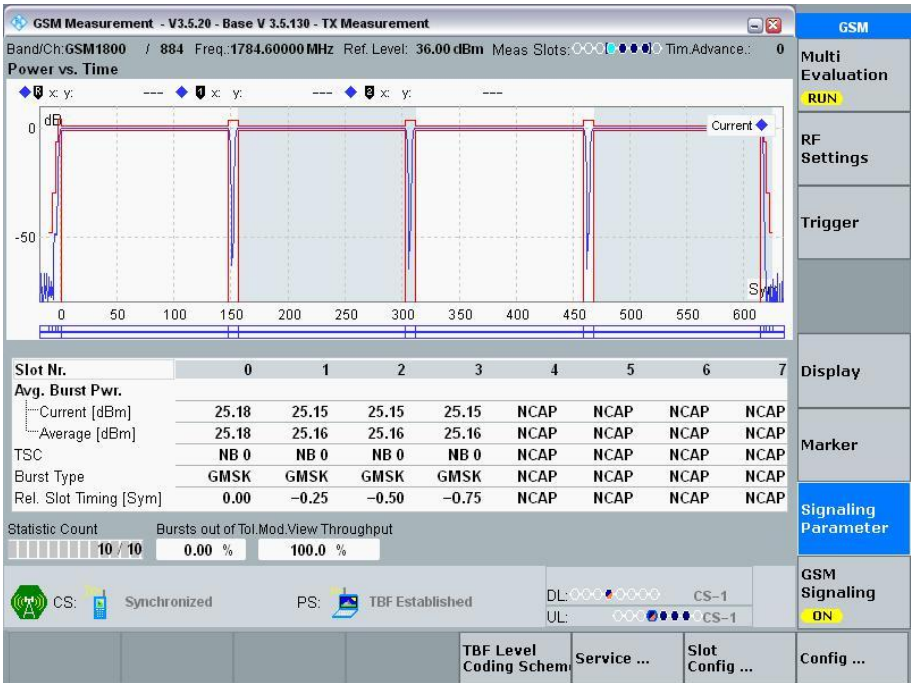
Normal Condition ( $\gamma=3$ ), Middle ChannelNormal Condition ( $\gamma=18$ ), Middle Channel

Normal Condition ( $\gamma=3$ ), Low ChannelNormal Condition ( $\gamma=18$ ), Low Channel

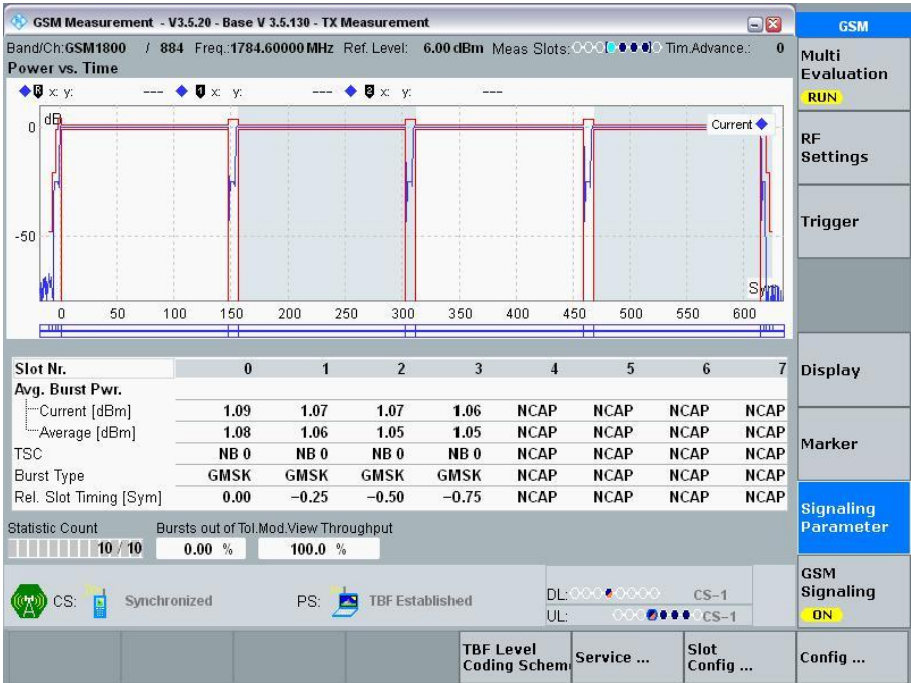


4 Uplink Slots

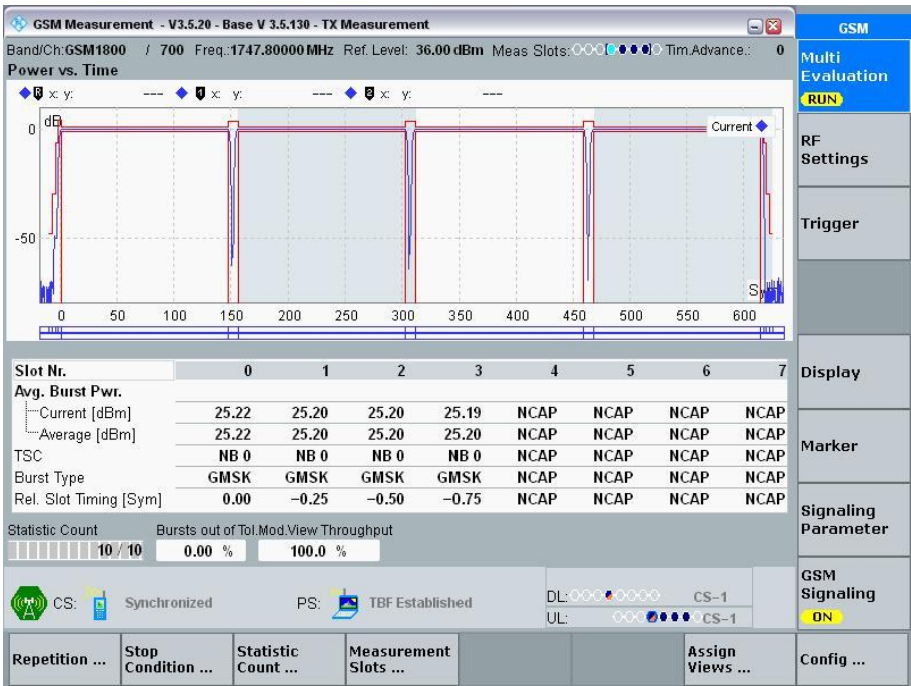
Normal Condition ( $\gamma=3$ ), High Channel



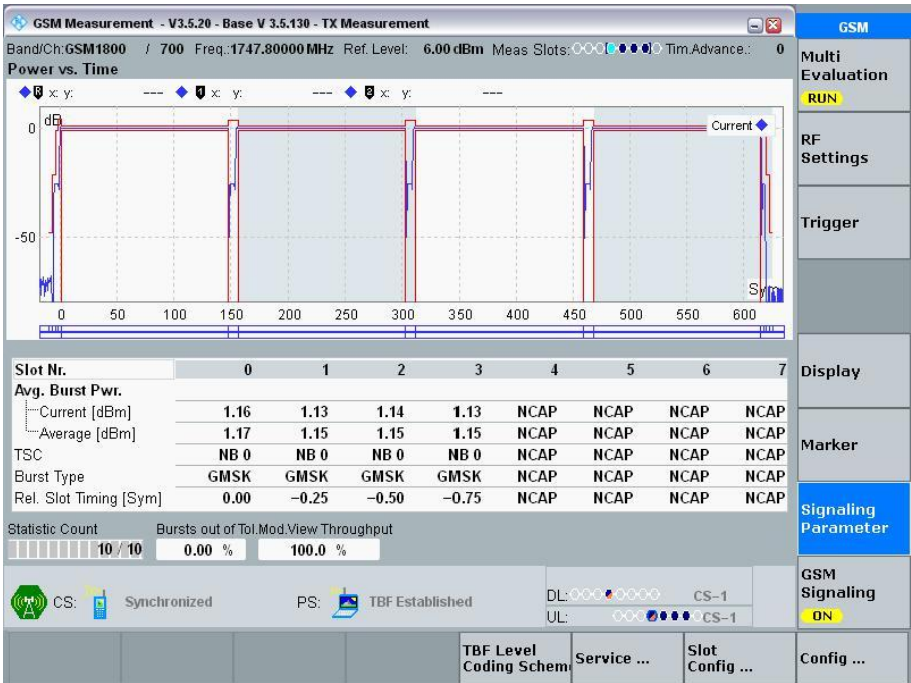
Normal Condition ( $\gamma=18$ ), High Channel



Normal Condition ( $\gamma=3$ ), Middle Channel

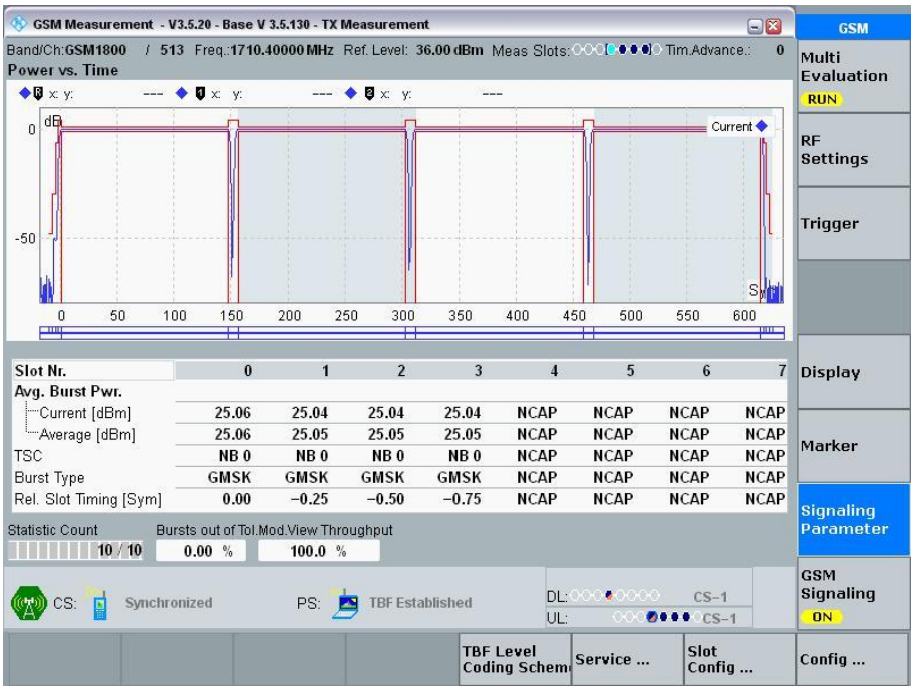


Normal Condition ( $\gamma=18$ ), Middle Channel

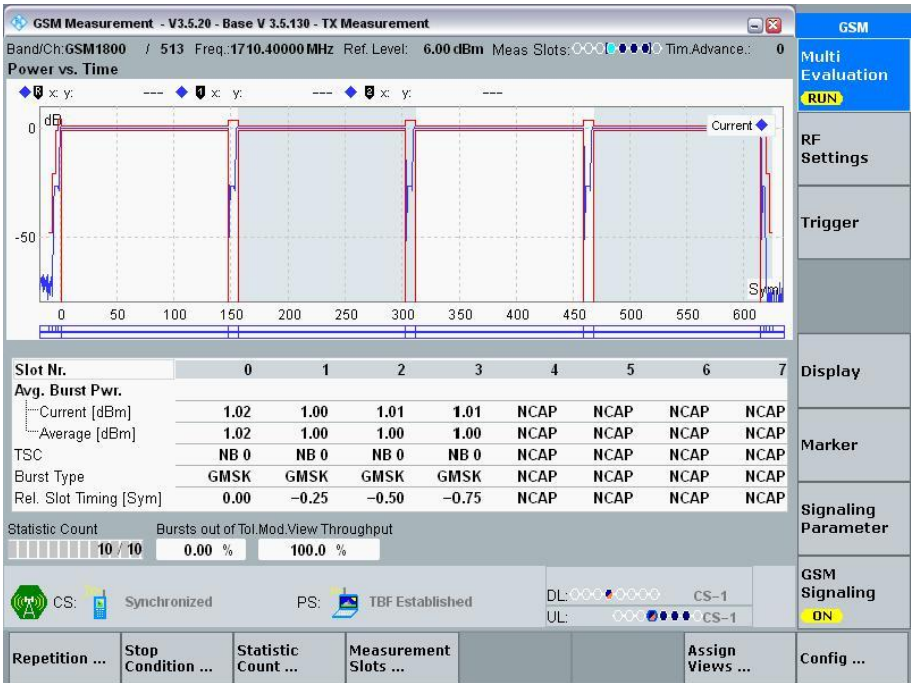




Normal Condition ( $\gamma=3$ ), Low Channel



Normal Condition ( $\gamma=18$ ), Low Channel



## §4.2.11 - OUTPUT RF SPECTRUM IN GPRS MULTISLOT CONFIGURATION

### Applicable Standard

According to EN 301 511 V12.5.1 (2017-03), 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 200 kHz 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 -79dBm, in the band 925 MHz to 935 MHz shall be no more than -67dBm and in the band 1 805 MHz to 1 880 MHz shall be no more than -71dBm except in five measurements in each of the bands 925 MHz to 960 MHz and 1 805 MHz to 1 880 MHz where exceptions at up to -36dBm 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 -67dBm 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 -36dBm 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 -79dBm, in the band of 757 MHz to 762 MHz shall be no more than -73dBm, in the band 869 MHz to 894 MHz shall be no more than -79dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71dBm 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 -36dBm 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 -79dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71dBm 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 -36dBm 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 to 763		-73
869 to 894		-79
1930 to 1990		-71

## 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.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

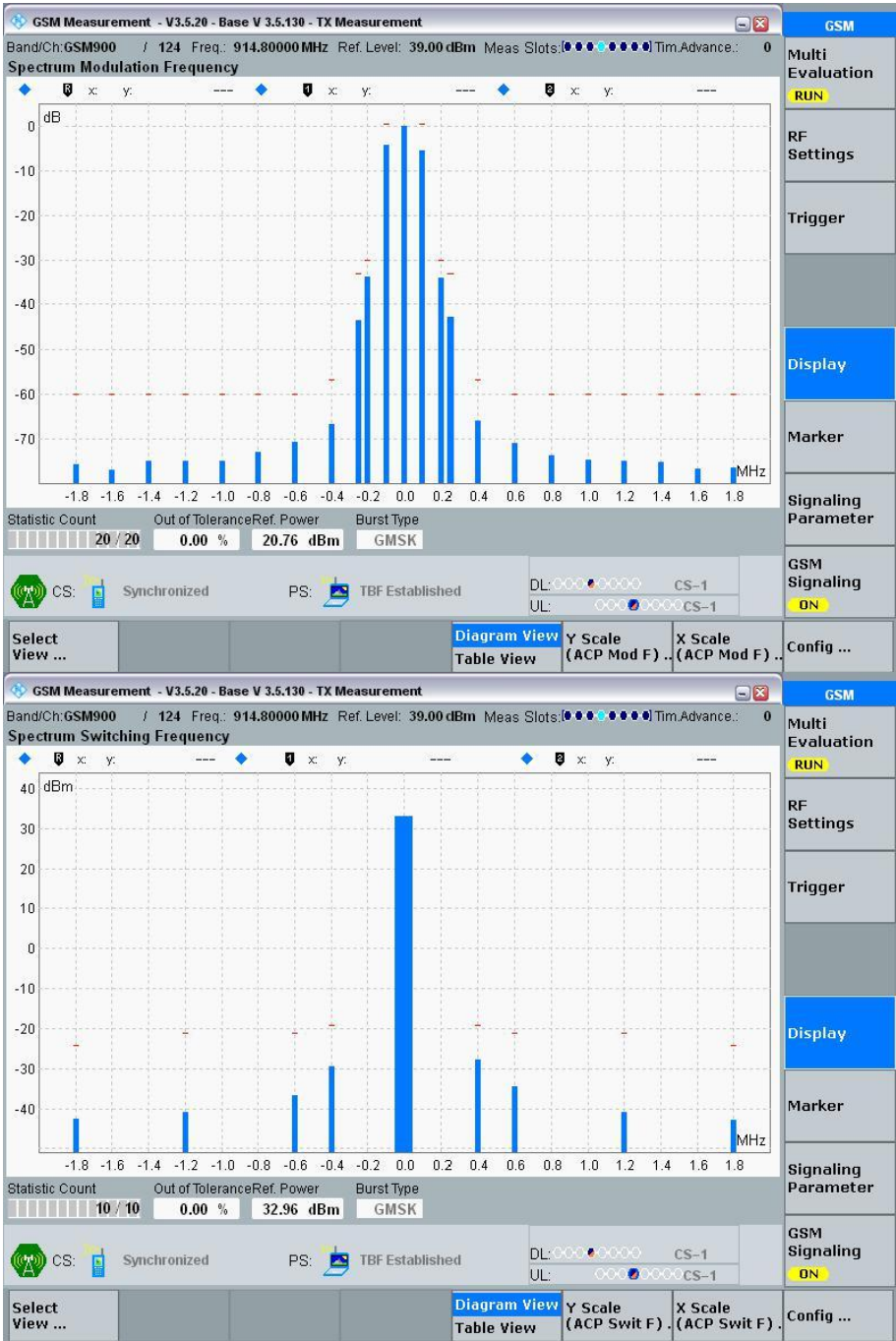
*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition					Result
GSM 900	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
DCS 1800	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Pass

**Normal Condition Test Data as below:**

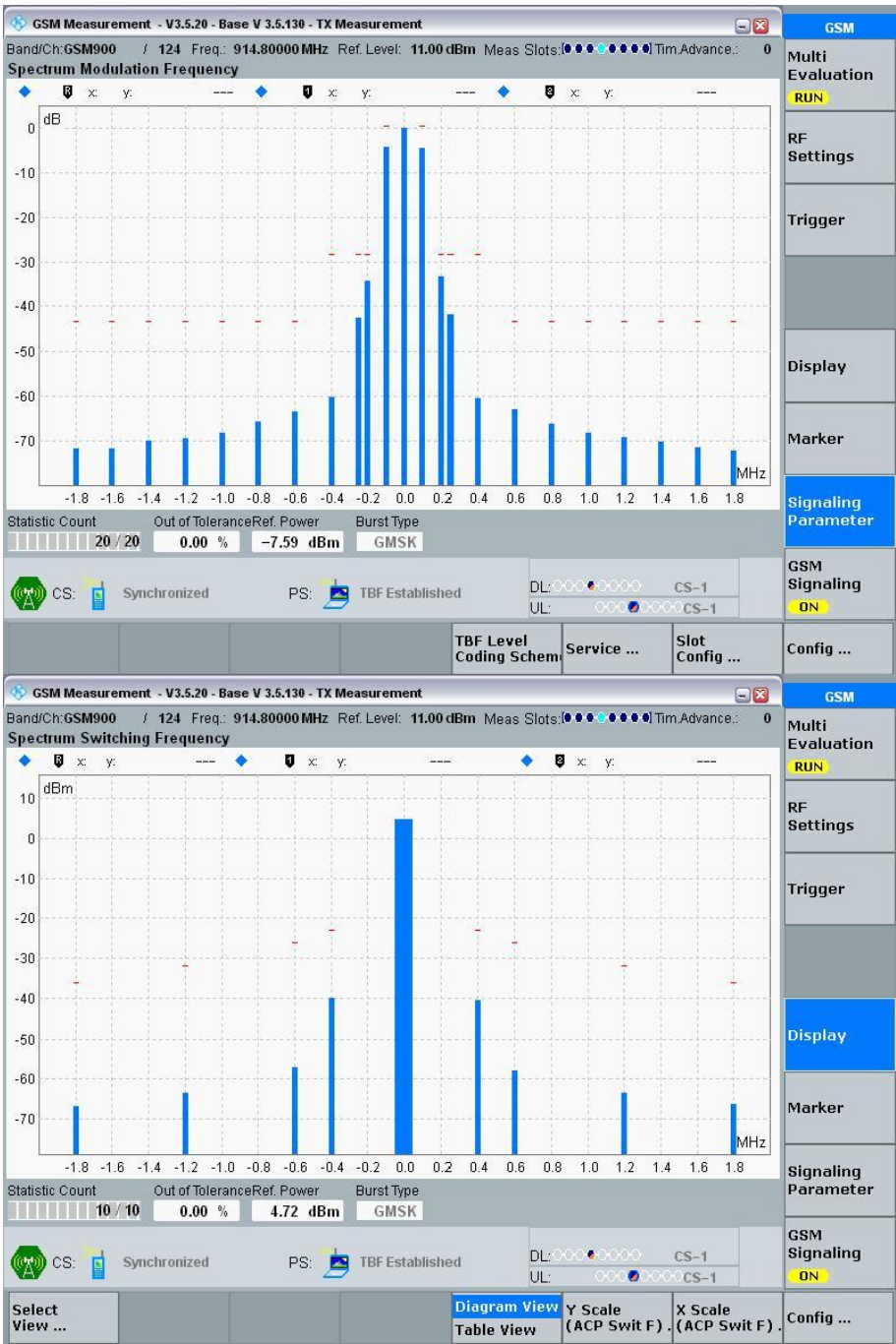
GSM900:

Normal Condition ( $\gamma=3$ ), High Channel

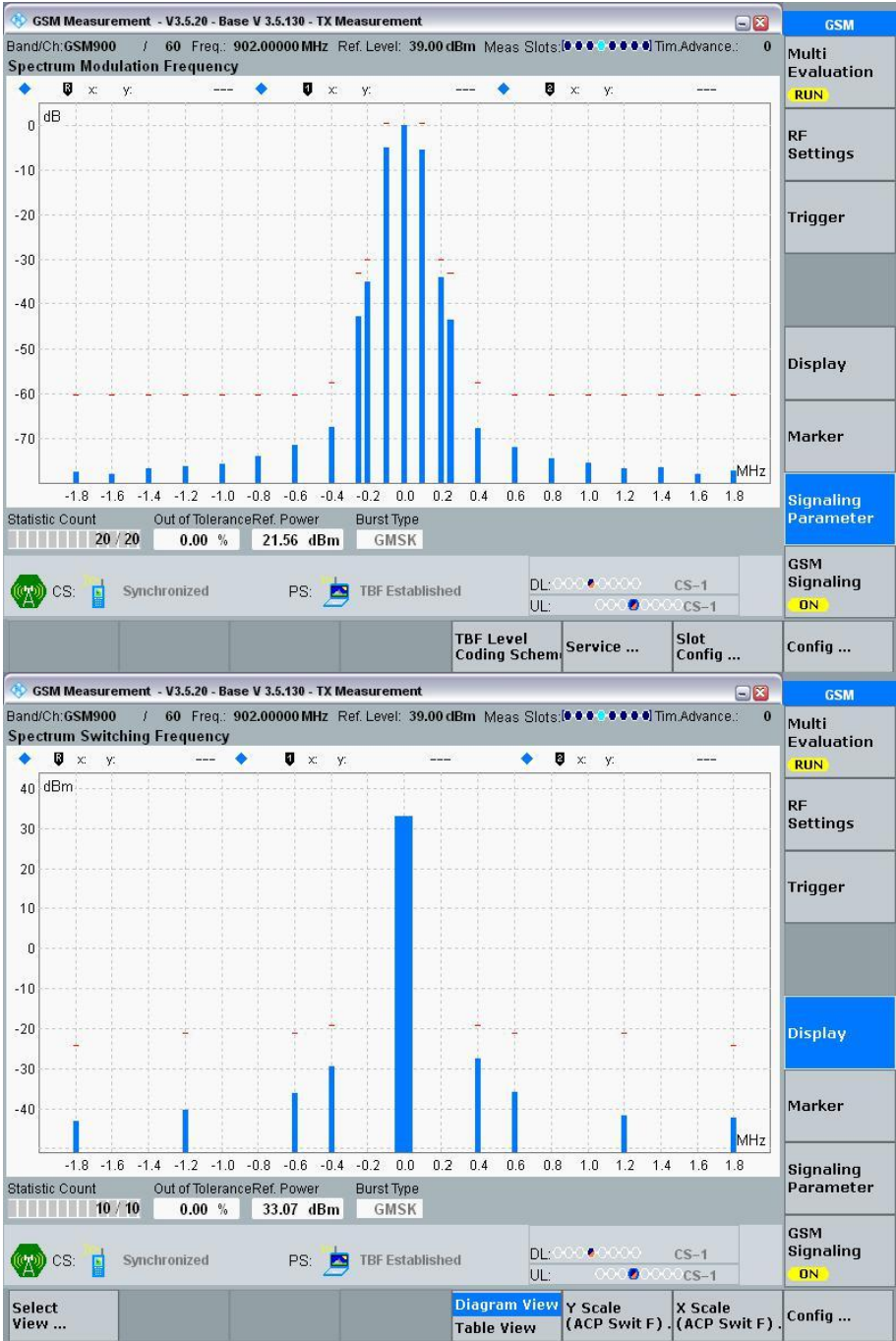




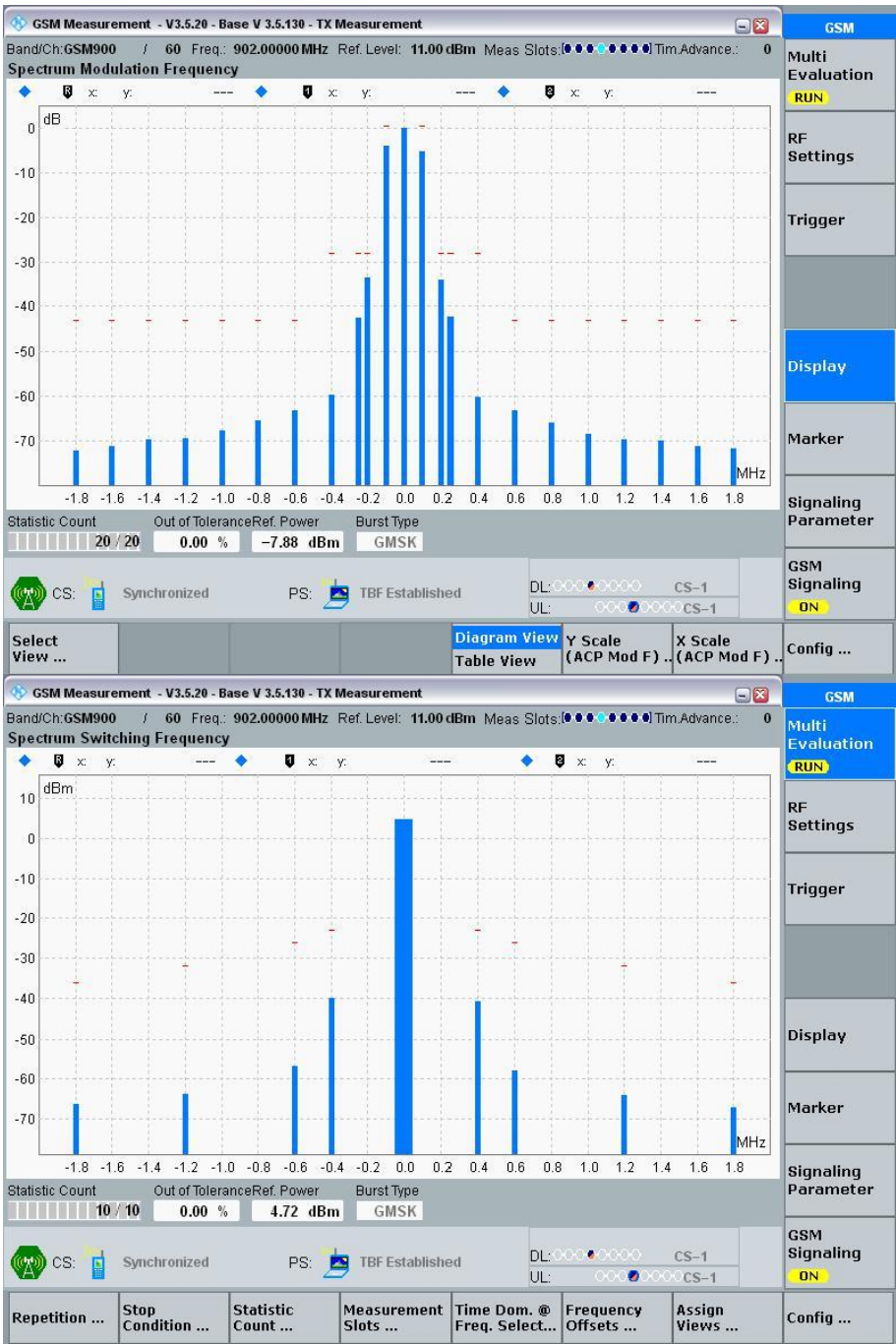
Normal Condition ( $\gamma=17$ ), High Channel



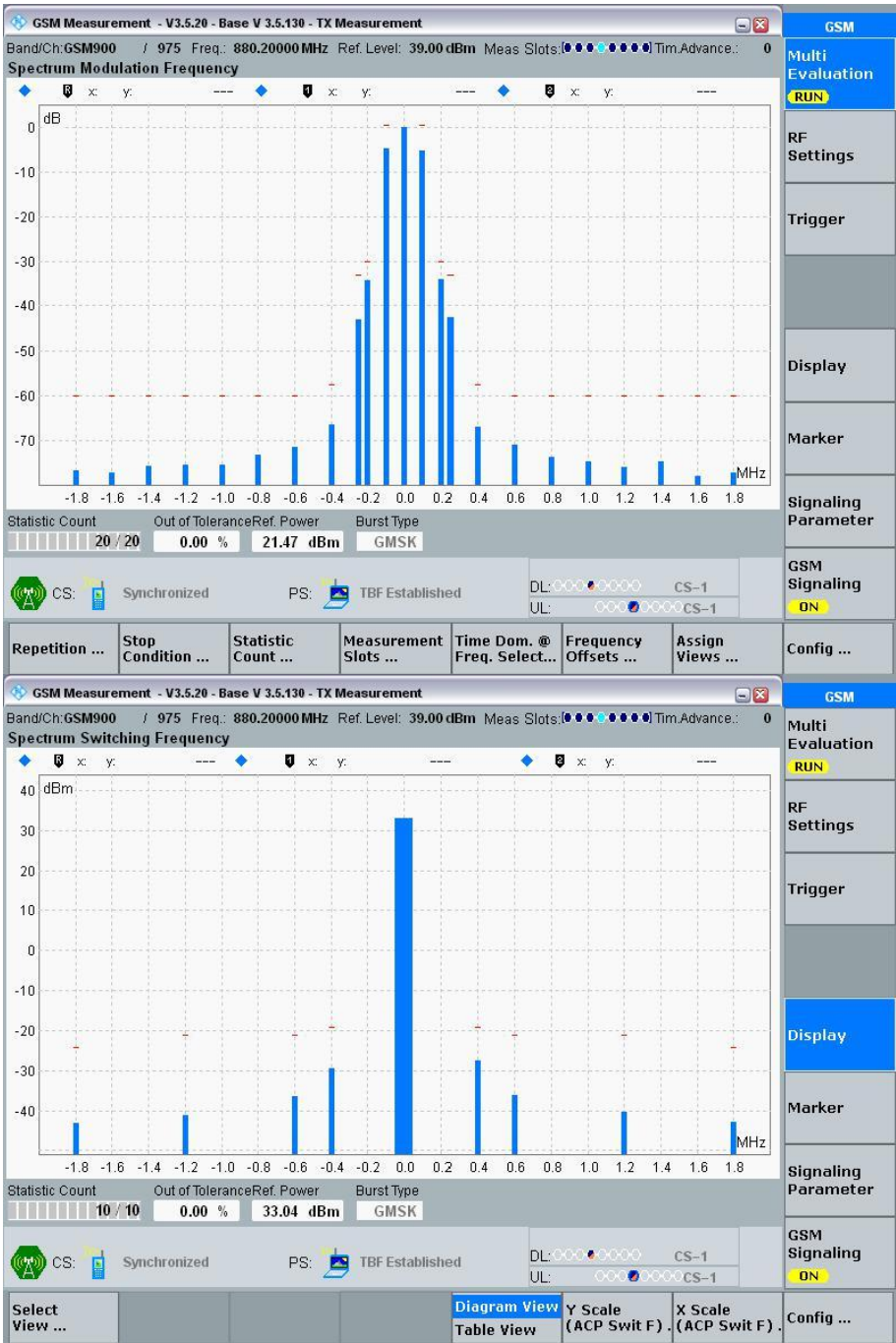
Normal Condition ( $\gamma=3$ ), Middle Channel



Normal Condition ( $\gamma=17$ ), Middle Channel

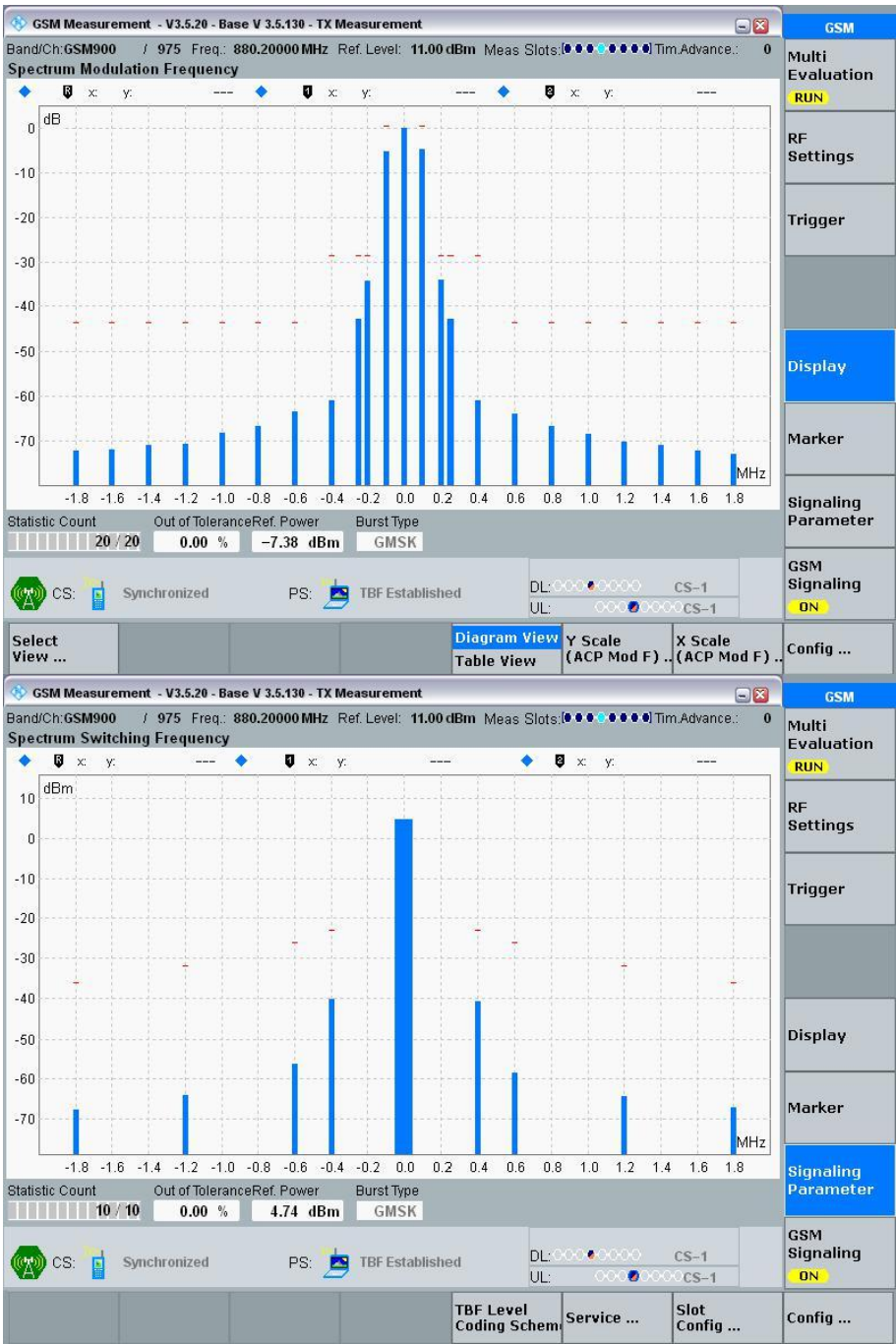


Normal Condition ( $\gamma=3$ ), Low Channel



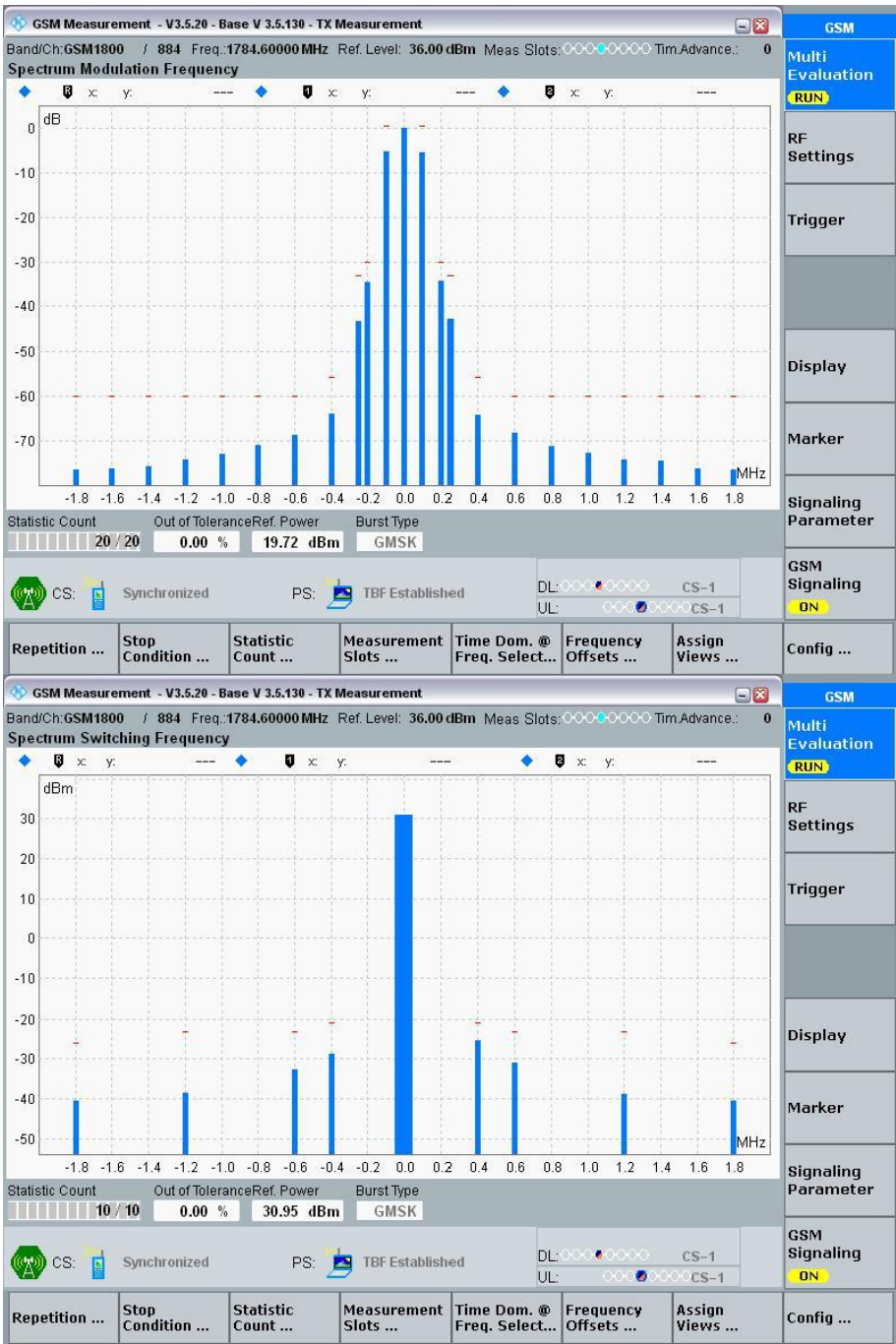


Normal Condition ( $\gamma=17$ ), Low Channel



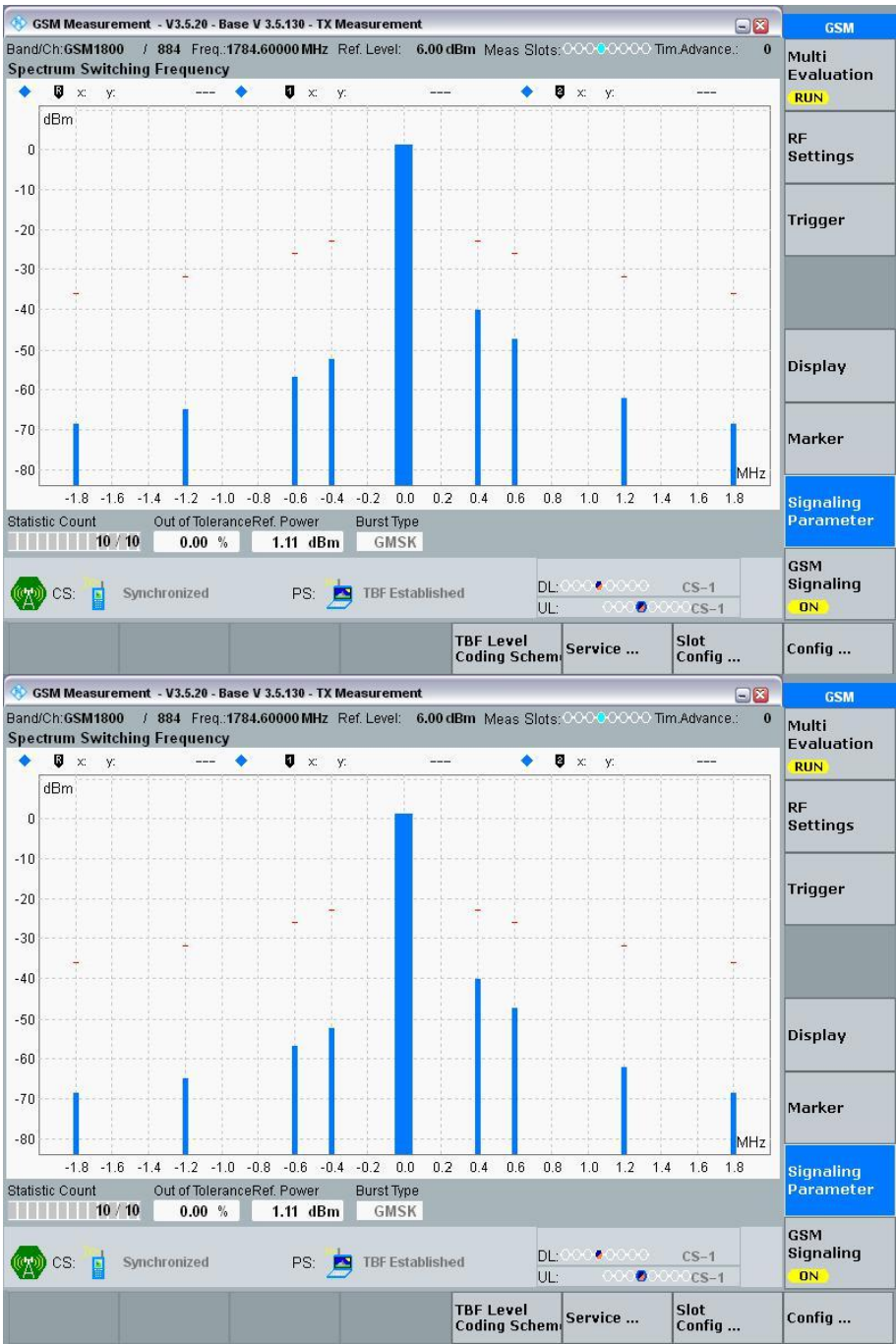
DCS1800:

Normal Condition ( $\gamma=3$ ), High Channel

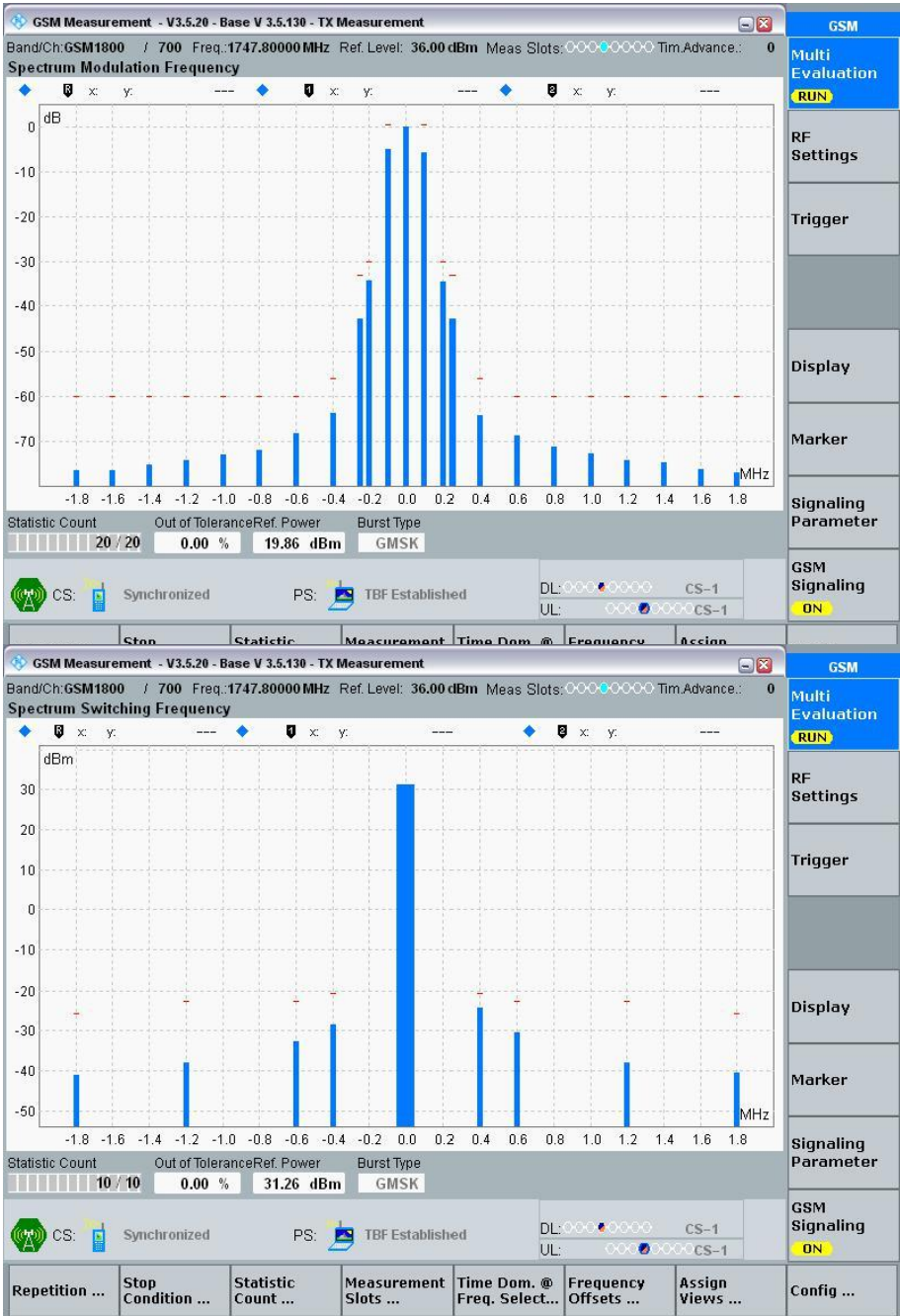




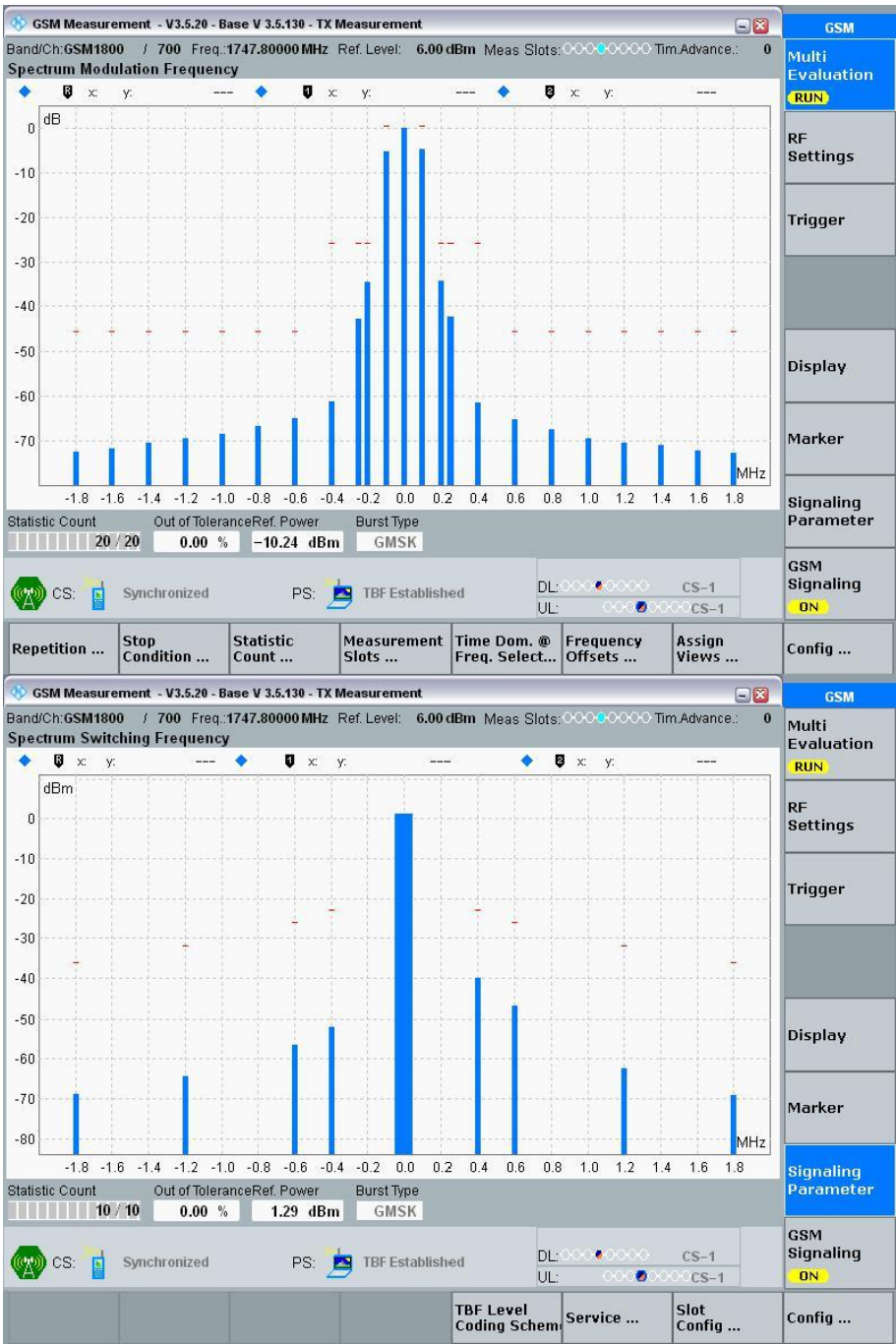
Normal Condition ( $\gamma=18$ ), High Channel



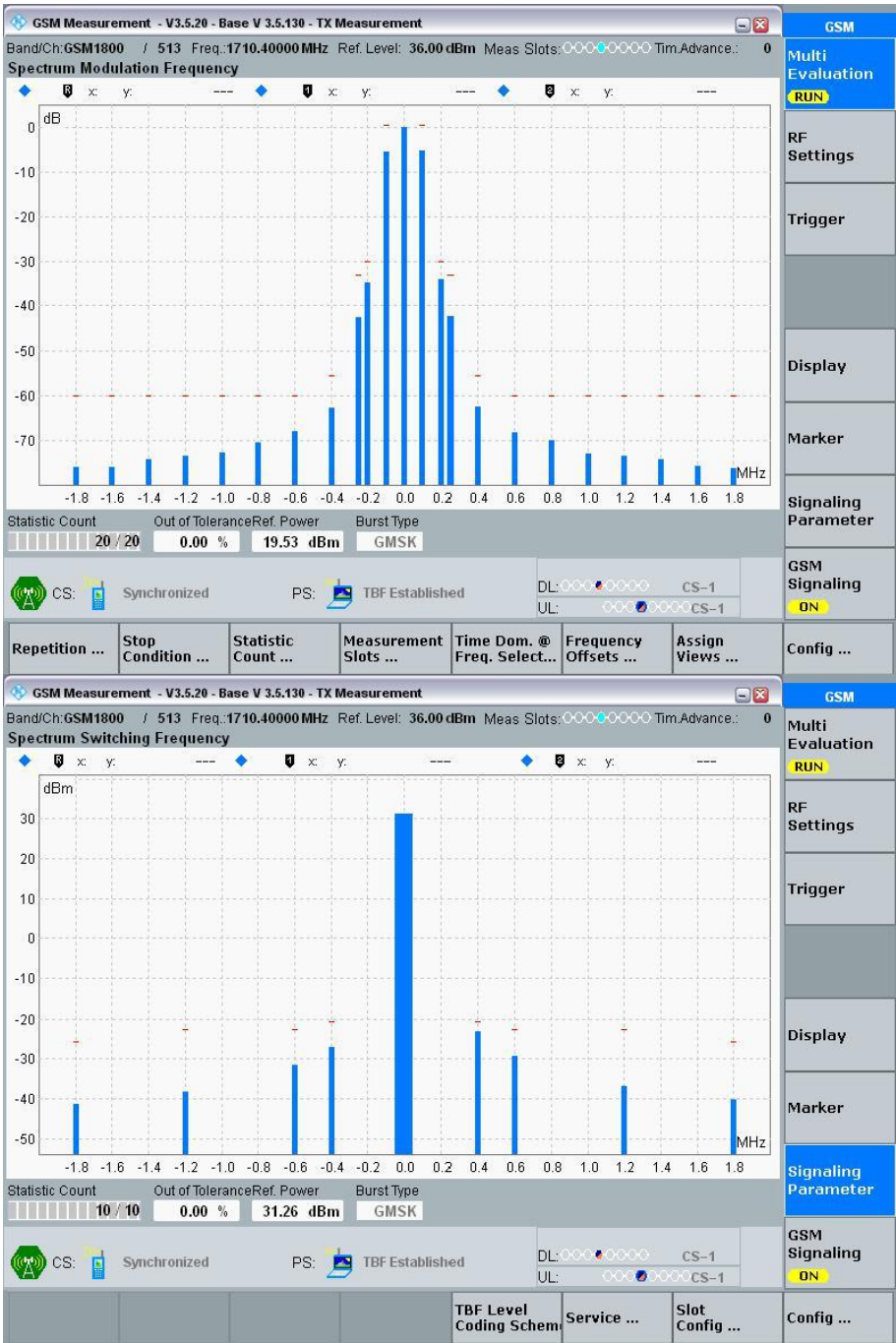
Normal Condition ( $\gamma=3$ ), Middle Channel



Normal Condition ( $\gamma=18$ ), Middle Channel

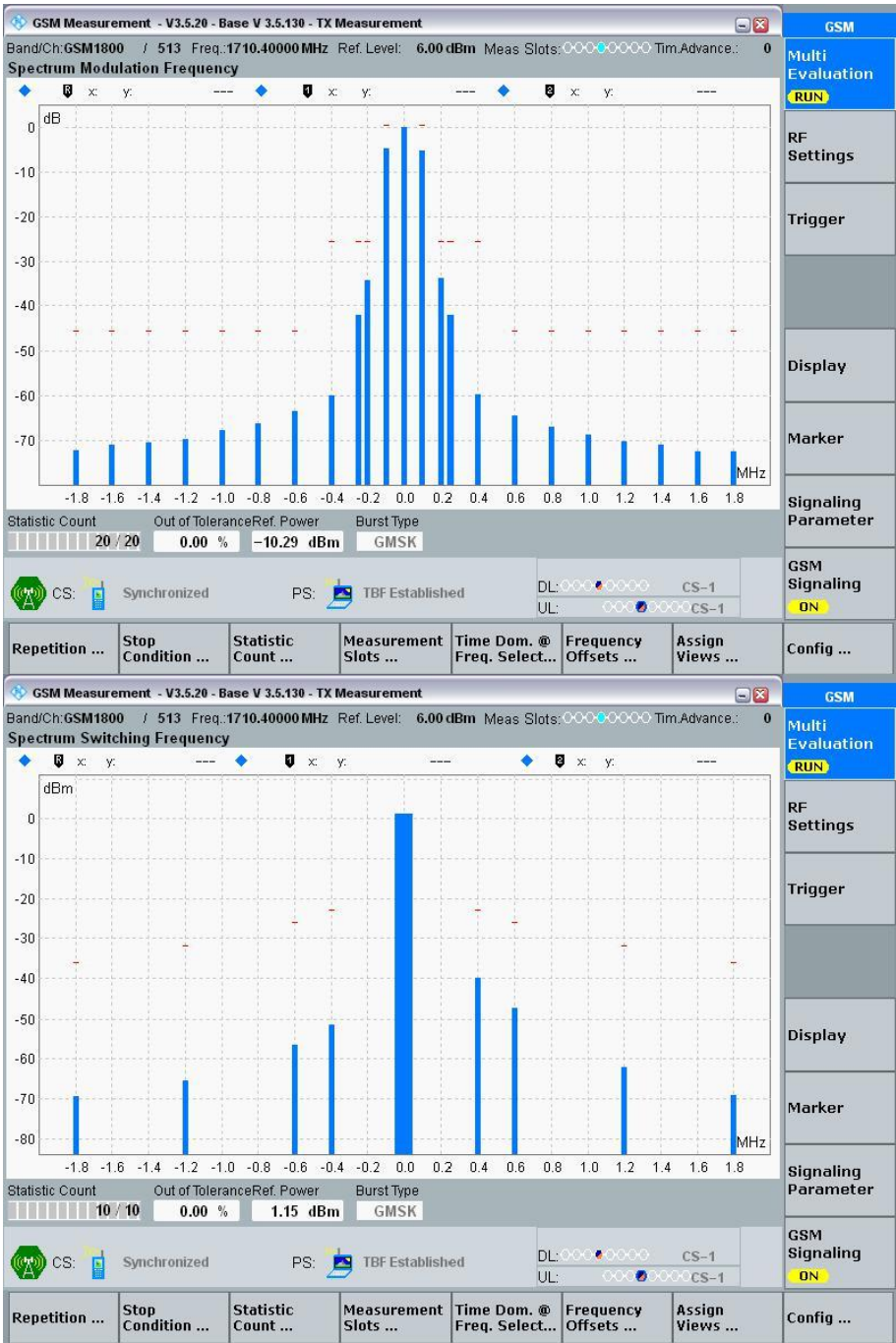


Normal Condition ( $\gamma=3$ ), Low Channel





Normal Condition ( $\gamma=18$ ), Low Channel



**Spurious Emissions in the MS receive bands:****For GSM900 Band (Middle Channel)**

Frequency range (MHz)	Frequency (MHz)	Spurious Emissions		
		Level (dBm)	Limit (dBm)	Results
925-935	927.46	-76.54	-67	Pass
935-960	937.80	-82.63	-79	Pass
	950.49	-82.18	-79	Pass

**For DCS1800 Band (Middle channel)**

Frequency range (MHz)	Frequency (MHz)	Spurious Emissions		
		Level (dBm)	Limit (dBm)	Results
1805-1880	1819.79	-77.17	-71	Pass
	1844.90	-74.27	-71	Pass
	1846.42	-73.46	-71	Pass
	1866.32	-74.28	-71	Pass

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



## §4.2.12 - CONDUCTED SPURIOUS EMISSIONS – MS ALLOCATED A CHANNEL

### Applicable Standard

Requirements: According to EN 301 511 V12.5.1 (2017-03), 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 12.1:

Table 12.1

Frequency range	Power level in dBm		
	GSM 400, GSM 700, T-GSM 810 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	

### 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  $\Omega$  load.

The measurement bandwidth based on a 5 pole synchronously tuned filter is according to table 12.2. 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 12.2

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

Table 12.2 (continued)

Frequency range	Frequency offset	Filter bandwidth	Approx video bandwidth
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.			

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	55 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition			Result
GSM 900	Middle	Normal	H.V	L.V	Pass
DCS 1800	Middle	Normal	H.V	L.V	Pass

**Normal Condition Test Data as below:**

Mode	Frequency Range (MHz)	Detector (Peak or Average)	RBW/VBW Setting (kHz)	Result Level (dBm)	Limit (dBm)	Margin (dB)	Result
GSM 900	0.1-50	Peak	10/30	-68.61	-36	32.61	Pass
	50-500	Peak	100/300	-60.85	-36	24.85	Pass
	500-850	Peak	3000/3000	-54.14	-36	18.14	Pass
	850-860	Peak	1000/3000	-57.63	-36	21.63	Pass
	860-870	Peak	300/1000	-62.33	-36	26.33	Pass
	870-880	Peak	100/300	-65.03	-36	29.03	Pass
	880-896	Peak	100/300	-47.96	-36	11.96	Pass
	896-900.2	Peak	30/100	-60.72	-36	24.72	Pass
	903.8-908	Peak	30/100	-54.08	-36	18.08	Pass
	908-915	Peak	100/300	-51.06	-36	15.06	Pass
	915-925	Peak	100/300	-64.43	-36	28.43	Pass
	960-1000	Peak	3000/3000	-53.92	-36	17.92	Pass
	1000-12750	Peak	3000/3000	-49.18	-30	19.18	Pass
DCS 1800	0.1-50	Peak	10/30	-68.47	-36	32.47	Pass
	50-500	Peak	100/300	-60.89	-36	24.89	Pass
	500-1000	Peak	3000/3000	-55.83	-36	19.83	Pass
	1000-1680	Peak	3000/3000	-49.41	-30	19.41	Pass
	1680-1690	Peak	1000/3000	-62.27	-30	32.27	Pass
	1690-1700	Peak	300/1000	-63.66	-30	33.66	Pass
	1700-1710	Peak	100/300	-47.22	-30	17.22	Pass
	1710-1741.8	Peak	100/300	-50.46	-36	14.46	Pass
	1741.8-1746	Peak	30/100	-55.33	-36	19.33	Pass
	1749.6-1753.8	Peak	30/100	-46.65	-36	10.65	Pass
	1753.8-1785	Peak	100/300	-62.05	-36	26.05	Pass
	1785-1795	Peak	100/300	-60.55	-30	30.55	Pass
	1795-1805	Peak	300/1000	-52.18	-30	22.18	Pass
	1880-12750	Peak	3000/3000	-55.13	-30	25.13	Pass

Note 1: 925-960MHz is RX bands, please refer to sub clause §4.2.6.

Note 2: 1805-1880MHz is RX bands, please refer to sub clause §4.2.6.

## §4.2.13 - CONDUCTED SPURIOUS EMISSIONS – MS IN IDLE MODE

### Applicable Standard

Requirements: According to EN 301 511 V12.5.1 (2017-03), 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

### 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  $\Omega$  load.

The measurement bandwidth based on a 5 pole synchronously tuned filter is set according to table 12.5. 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 12.5

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])

### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition			Result
GSM 900	Middle	Normal	H.V	L.V	Pass
DCS 1800	Middle	Normal	H.V	L.V	Pass

**Normal Condition Test Data as below:**

Mode	Frequency Range (MHz)	Detector (Peak or Average)	RBW/VBW Setting (kHz)	Result Level (dBm)	Limit (dBm)	Margin (dB)	Result
GSM 900	0.1-50	Peak	10/30	-64.64	-57	7.64	Pass
	50-880	Peak	100/300	-66.65	-57	9.65	Pass
	880-915	Peak	100/300	-72.03	-59	13.03	Pass
	915-1000	Peak	100/300	-67.16	-57	10.16	Pass
	1000-1710	Peak	100/300	-61.82	-47	14.82	Pass
	1710-1785	Peak	100/300	-61.64	-53	8.64	Pass
	1785-12750	Peak	100/300	-61.03	-47	14.03	Pass
DCS 1800	0.1-50	Peak	10/30	-66.30	-57	9.3	Pass
	50-880	Peak	100/300	-61.85	-57	4.85	Pass
	880-915	Peak	100/300	-69.29	-59	10.29	Pass
	915-1000	Peak	100/300	-67.75	-57	10.75	Pass
	1000-1710	Peak	100/300	-63.89	-47	16.89	Pass
	1710-1785	Peak	100/300	-65.50	-53	12.5	Pass
	1785-12750	Peak	100/300	-54.69	-47	7.69	Pass

## §4.2.16 - RADIATED SPURIOUS EMISSIONS – MS ALLOCATED A CHANNEL

### Applicable Standard

Requirements: According to EN 301 511 V12.5.1 (2017-03), section 4.2.16, the radiated spurious power emitted by the MS, when allocated channel, shall be no more than the levels in table 12.7 under normal and extreme voltage conditions.

Table 12.7

Frequency range		Power level in dBm		
		GSM 400, GSM 700, T-GSM 810, 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	

### 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 12.8. 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 12.8

Frequency range	Frequency offset	Filter bandwidth	Approx video bandwidth
30 MHz to 50 MHz	-	10 kHz	30 kHz
50 MHz to 500 MHz	-	100 kHz	300 kHz
excl. relevant TX band: GSM 450: 450,4 MHz to 457,6 MHz; GSM 480: 478,8 MHz to 486 MHz 500 MHz to 4 GHz,	0 to 10 MHz ≥ 10 MHz ≥ 20 MHz ≥ 30 MHz	100 kHz 300 kHz 1 MHz 3 MHz	300 kHz 1 MHz 3 MHz 3 MHz
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	(offset from edge of relevant TX band)		
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.			

## Test Data

### Environmental Conditions

<b>Temperature:</b>	23 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08*

## Test Results

Scan 30 MHz -4 GHz, Low Channel, and Normal Voltage Condition, High Voltage Condition and Low Voltage Condition, and worst case as below:

***Tx***

Frequency (MHz)	Receiver Reading (dBm)	Turntable Angle Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
GSM900, Middle Channel								
172.59	-65.48	288	1.1	H	-6.38	-71.86	-36	35.86
174.42	-70.35	144	1.6	V	-5.22	-75.57	-36	39.57
3608	-41.33	107	1.9	H	4.16	-37.17	-30	7.17
3608	-43.93	13	1.1	V	4.08	-39.85	-30	9.85
DCS1800, Middle Channel								
172.59	-65.12	349	1.6	H	-6.38	-71.5	-36	35.5
174.42	-69.51	9	1.8	V	-5.22	-74.73	-36	38.73
3495.6	-42.91	360	1	H	4.16	-38.75	-30	8.75
3495.6	-44.67	44	1.4	V	4.08	-40.59	-30	10.59

Note:

Absolute Level = Reading Level + Substituted Factor

Substituted Factor contains: SG Level - Cable loss+ Antenna Gain

Margin = Limit - Absolute Level

## §4.2.17 - RADIATED SPURIOUS EMISSIONS – MS IN IDLE MODE

### Applicable Standard

Requirements: According to EN 301 511 V12.5.1 (2017-03), 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 12.9 under normal and extreme voltage conditions.

**Table 12.9**

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

### 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 12.10. 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 12.10**

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]).

**Test Data****Environmental Conditions**

<b>Temperature:</b>	23 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

**Test Results**

Scan 30 MHz -4 GHz, Middle Channel, and Normal Voltage Condition, High Voltage Condition and Low Voltage Condition, and worst case as below:

**Idle**

Frequency (MHz)	Receiver Reading (dBm)	Turntable Angle Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
GSM900, Middle Channel								
172.59	-64.99	294	1.4	H	-6.38	-71.37	-57	14.37
174.42	-70.04	48	1.9	V	-5.22	-75.26	-57	18.26
3308.18	-62.33	85	2.0	H	3.25	-59.08	-47	12.08
3135.98	-59.93	70	1.0	V	2.49	-57.44	-47	10.44
DCS1800, Middle Channel								
172.59	-64.29	223	1.3	H	-6.38	-70.67	-57	13.67
174.42	-68.92	16	1.5	V	-5.22	-74.14	-57	17.14
2789.46	-63.91	54	1.8	H	2.17	-61.74	-47	14.74
3489.84	-63.67	1	1.6	V	3.31	-60.36	-47	13.36

Note:

Absolute Level = Reading Level + Substituted Factor

Substituted Factor contains: SG Level - Cable loss+ Antenna Gain

Margin = Limit - Absolute Level

## §4.2.20 - RECEIVER BLOCKING AND SPURIOUS RESPONSE – SPEECH CHANNELS

### Applicable Standard

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  $f_0$ , 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  $f_0$  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 dB  $\mu$ V(emf) (i.e. -43 dBm). 3GPP TS 05.05, sub clause 5.1.

### 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  $\pm$ 600 kHz are excluded.

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

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

- i) The total frequency range formed by:

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



DCS 1 800 the frequencies between  $F_{lo} + (IF_1 + IF_2 + \dots + IF_n + 37,5 \text{ MHz})$  and  $F_{lo} - (IF_1 + IF_2 + \dots + IF_n + 37,5 \text{ MHz})$ .

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

Measurements are made at 200 kHz intervals.

ii) The three frequencies  $IF_1$ ,  $IF_1 + 200 \text{ kHz}$ ,  $IF_1 - 200 \text{ kHz}$ .

iii) The frequencies:

$mF_{lo} + IF_1$ ;

$mF_{lo} - IF_1$ ;

$mFR$ ;

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

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

Where:

$F_{lo}$  - local oscillator applied to first receiver mixer

$IF_1 \dots IF_n$  - are the  $n$  intermediate frequencies

$F_{lo}$ ,  $IF_1$ ,  $IF_2 \dots IF_n$  - shall be declared by the manufacturer in the PIXIT statement 3GPP TS 51.010-1 annex 3.

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

Table 14-28a: Level of unwanted signals

FREQUENCY	GSM 900		DCS 1 800
	Small MS	Other MS	
LEVEL IN $\text{dB}\mu\text{Vemf( )}$			
FR $\pm 600 \text{ kHz}$ to FR $\pm 800 \text{ kHz}$	70	75	70
FR $\pm 800 \text{ kHz}$ to FR $\pm 1,6 \text{ MHz}$	70	80	70
FR $\pm 1,6 \text{ MHz}$ to FR $\pm 3 \text{ MHz}$	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		GSM 480	
	Small MS	Other MS	Small MS	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 LEVEL IN dBμVemf( )	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 dBμVemf( ).

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 dBμVemf( ). 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 dBμVemf( ).

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.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

**GSM 900 Band:**

<b>Test Channel</b>	<b>RBER (%)</b>	<b>Number of test samples</b>	<b>Limit (%)</b>	<b>Result</b>
Low	0.029	10000	2.439	pass
Middle	0.011	10000	2.439	pass
High	0.023	10000	2.439	pass

**DCS 1800 Band:**

<b>Test Channel</b>	<b>RBER (%)</b>	<b>Number of test samples</b>	<b>Limit (%)</b>	<b>Result</b>
Low	0.012	10000	2.439	pass
Middle	0.016	10000	2.439	pass
High	0.028	10000	2.439	pass

## §4.2.26 - FREQUENCY ERROR AND MODULATION ACCURACY IN EGPRS CONFIGURATION

### Applicable Standard

According to EN 301 511 V12.5.1 (2017-03), section 4.2.26, 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.

### Test Procedure

Procedure for 8PSK Frequency error and modulation accuracy measurements:

Please refer to Clauses 13.17.1.4.2 of ETSI TS 151 010-1 [2] V13.3.0 (2017-03)

### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

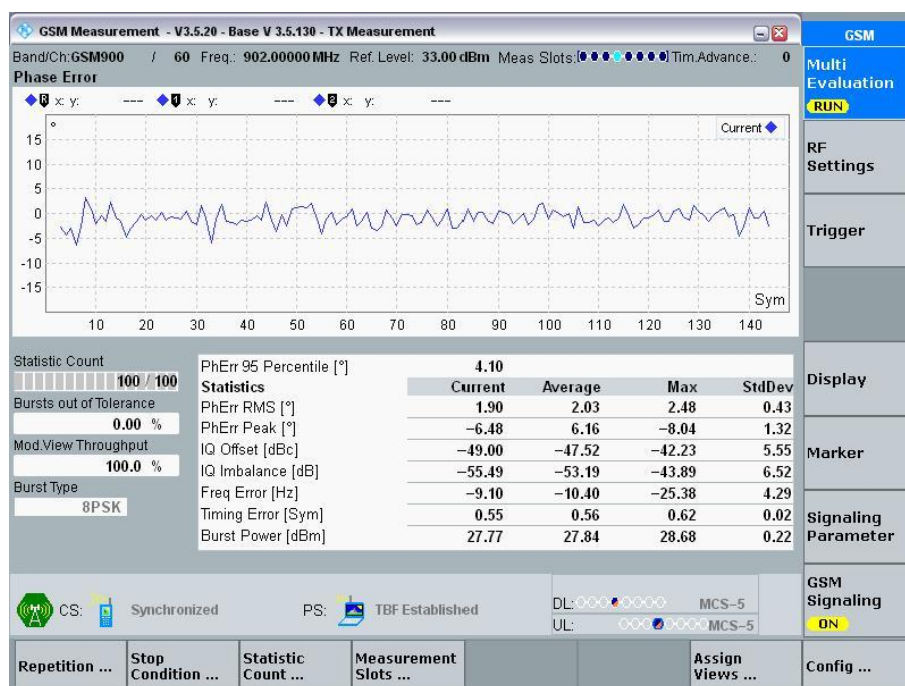
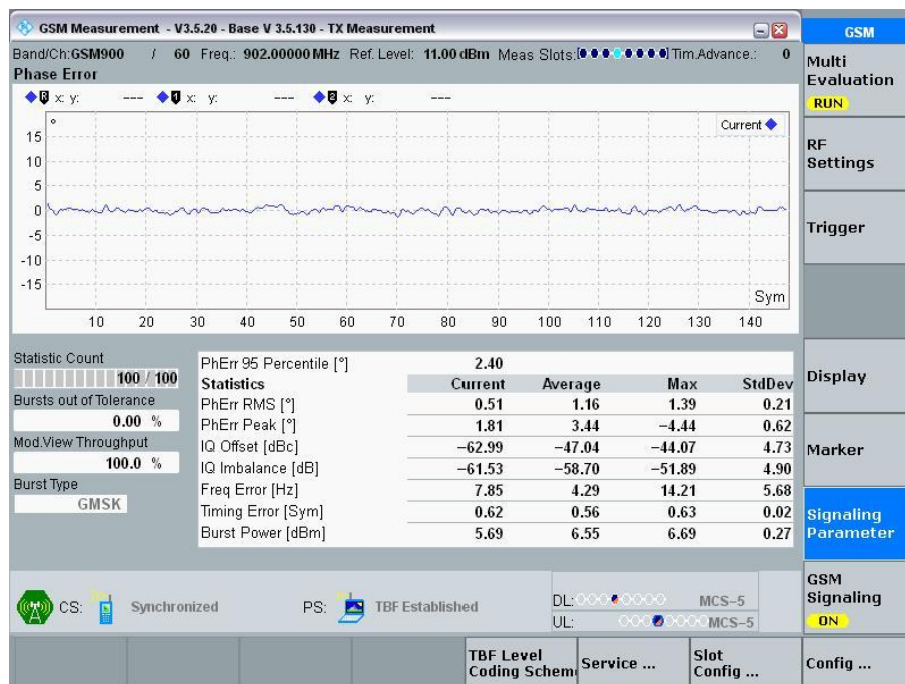
*The testing was performed by Fan Yang on 2021-05-08.*

**Test Result:** Pass, please see the following plots:

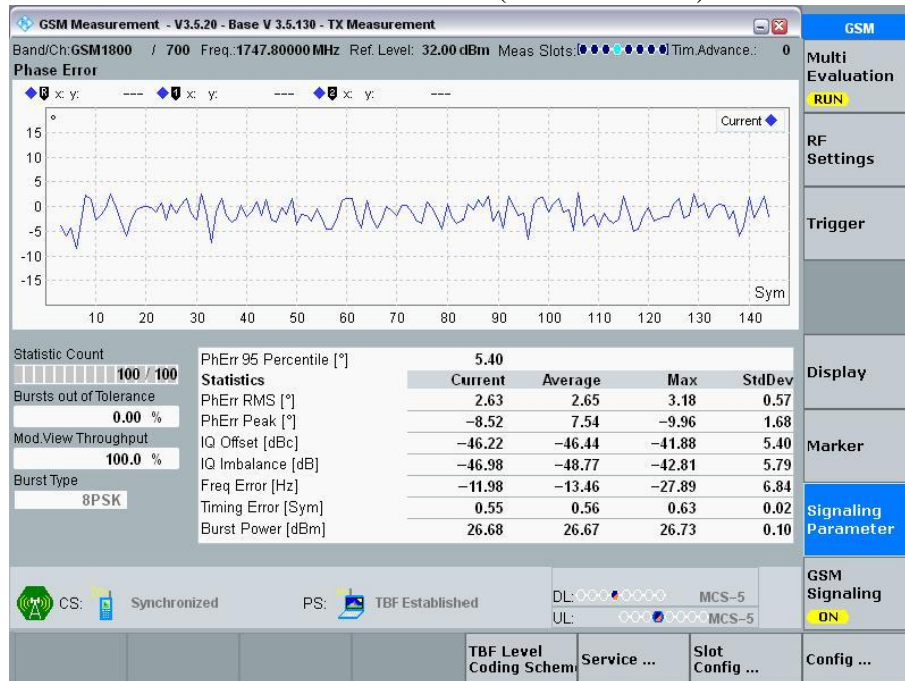
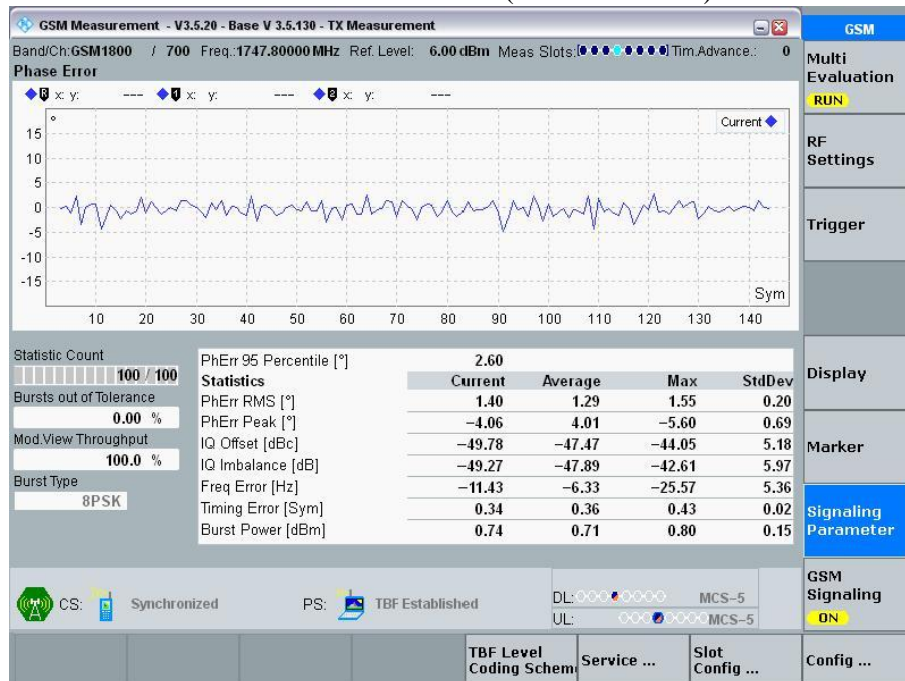
#### Frequency error and phase error

Mode	Test Channel	Test Condition					Result
EGPRS 900	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
EGPRS1800	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

**Normal Condition Test Data as below:**

**EGRPS 900 (Middle Channel)****Power Control Level 6 (Middle Channel)****Power Control Level 17 (Middle Channel)**



**EGRPS 1800 (Middle Channel)****Power Control Level 5 (Middle Channel)****Power Control Level 18 (Middle Channel)**

## §4.2.27 - FREQUENCY ERROR UNDER MULTIPATH AND INTERFERENCE CONDITIONS IN EGPRS CONFIGURATION

### Applicable Standard

Requirement: Per EN 301 511 V12.5.1 (2017-03), section 4.2.26, 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.

### Test Procedure

Please refer to Clauses 13.17.2.4.2 of ETSI TS 151 010-1 [2] V13.3.0(2017-03)

### 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

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition					Result
EGPRS 900	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
EGPRS 1800	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

**Normal Condition Test Data as below:****EGPRS 900 (Middle Channel)**

1) *MS under maximum power control level: 6*

EGSM 900	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
Ref. Freq. 902.0 (MHz)	Normal	RA250	98	±300	Pass
		HT100	39	±180	Pass
		TU50	14	±160	Pass
		TU3	22	±230	Pass

2) *MS under minimum power control level:17*

EGSM 900	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
Ref. Freq. 902.0 (MHz)	Normal	RA250	105	±300	Pass
		HT100	41	±180	Pass
		TU50	36	±160	Pass
		TU3	24	±230	Pass

**EGPRS 1800 (Middle Channel)**

3) *MS under maximum power control level: 5*

<b>DCS 1800</b>  Ref. Freq.  1747.8 (MHz)	<b>Test Condition</b>		<b>Frequency error (Hz)</b>	<b>Limit (Hz)</b>	<b>Result</b>
	<b>Normal</b>	RA130	98	±400	Pass
		HT100	35	±350	Pass
		TU50	27	±260	Pass
		TU1.5	15	±320	Pass

4) *MS under minimum power control level: 18*

<b>DCS 1800</b>  Ref. Freq.  1747.8 (MHz)	<b>Test Condition</b>		<b>Frequency error (Hz)</b>	<b>Limit (Hz)</b>	<b>Result</b>
	<b>Normal</b>	RA130	89	±400	Pass
		HT100	25	±350	Pass
		TU50	31	±260	Pass
		TU1.5	6	±320	Pass

## §4.2.28 - EGPRS TRANSMITTER OUTPUT POWER

### Applicable Standard

EN 301 511 V12.5.1 (2017-03), section 4.2.28:

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  $\pm 2$  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  $\pm 2,5$  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  $\pm 3$  dB,  $\pm 4$  dB or  $\pm 5$  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  $\pm 4$  dB,  $\pm 5$  dB or  $\pm 6$  dB under extreme conditions; 3GPP TS 05.05, sub clause 4.1.1; 3GPP TS 05.05 annex D subclasses 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  $2 \pm 1,5$  dB ( $1 \pm 1$  dB 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  $\pm 1$  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.

### Test Procedure

Please refer to Clauses 13.17.3.4.1.2 of ETSI TS 151 010-1 [2] V13.3.0(2017-03)

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

**Test Results:** Pass.

Please refer to following tables.

Mode	Test Channel	Test Condition					Result
EGPRS 900	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
EGPRS 1800	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance



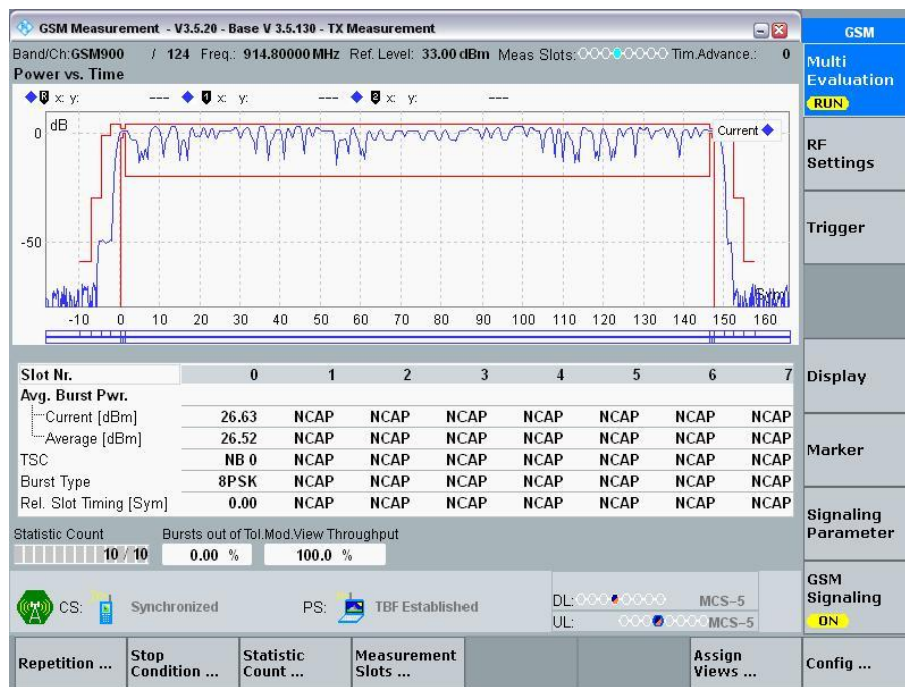
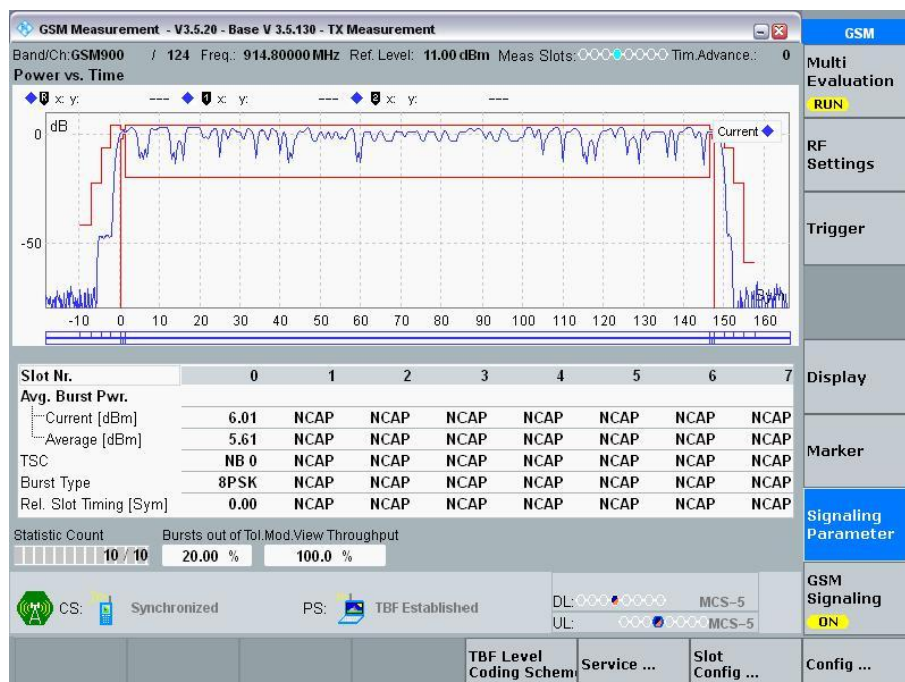
**Normal Condition Test Data as below:****EGPRS 900 output power**

Power Control Level	Output power (dBm)			Result
	Low Channel	Middle Channel	High Channel	
1 uplink slot				Pass
6	27.07	27.20	26.52	
7	26.04	26.18	25.70	
8	24.65	24.40	24.24	
9	22.58	22.06	22.59	
10	20.81	20.31	20.43	
11	18.61	18.18	18.36	
12	16.87	16.67	16.86	
13	14.50	14.35	14.89	
14	12.33	12.12	12.02	
15	10.08	9.70	10.13	
16	7.22	7.68	7.53	
17	5.66	5.75	5.61	
2 uplink slots				
6	26.86	26.92	26.47	
17	5.54	5.56	5.30	
3 uplink slots				
6	25.88	26.14	25.99	
17	5.53	5.77	5.63	
4 uplink slots				
6	24.35	23.79	23.52	
17	4.94	5.12	5.18	

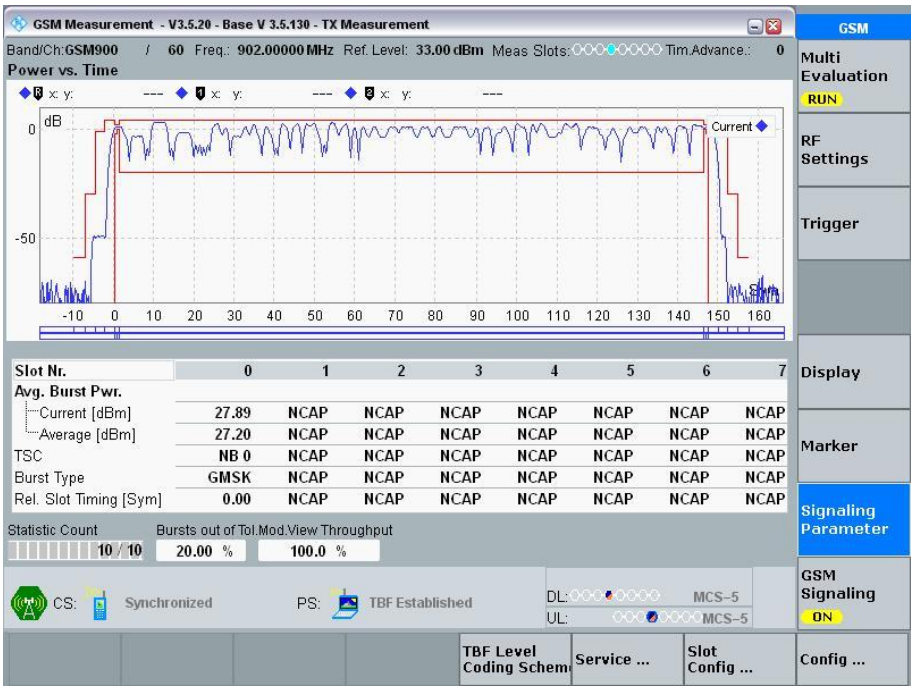
## EGPRS 900:

## Normal Condition:

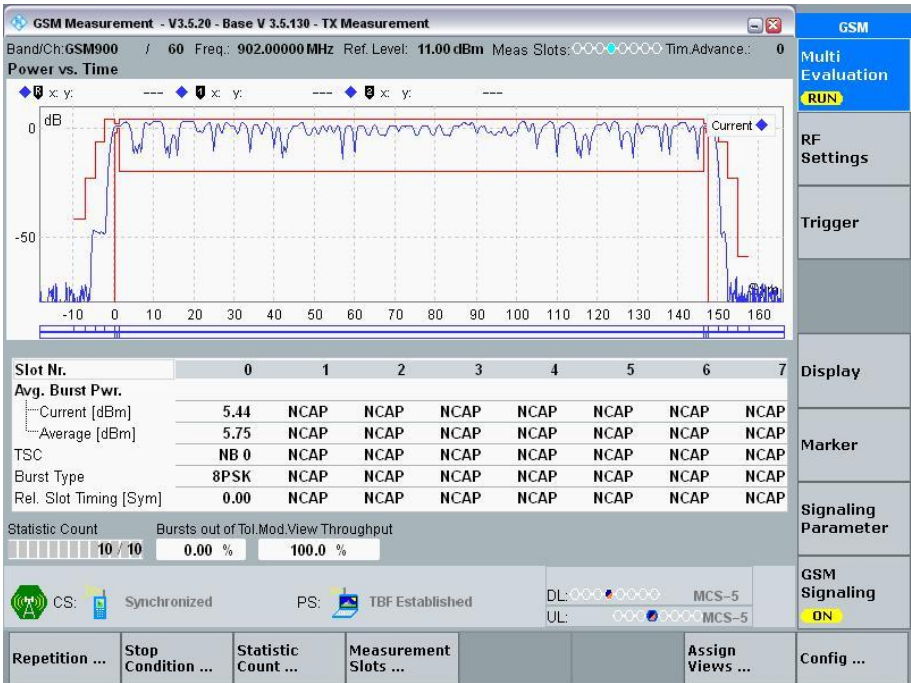
## 1 Uplink Slot

Normal Condition ( $\gamma=6$ ), High ChannelNormal Condition ( $\gamma=17$ ), High Channel

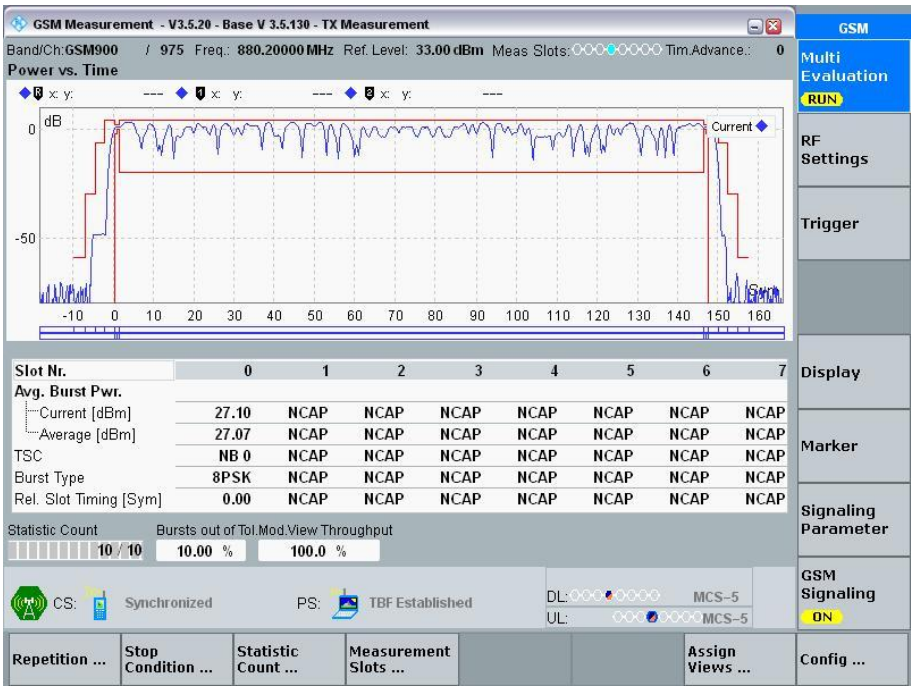
Normal Condition ( $\gamma=6$ ), Middle Channel



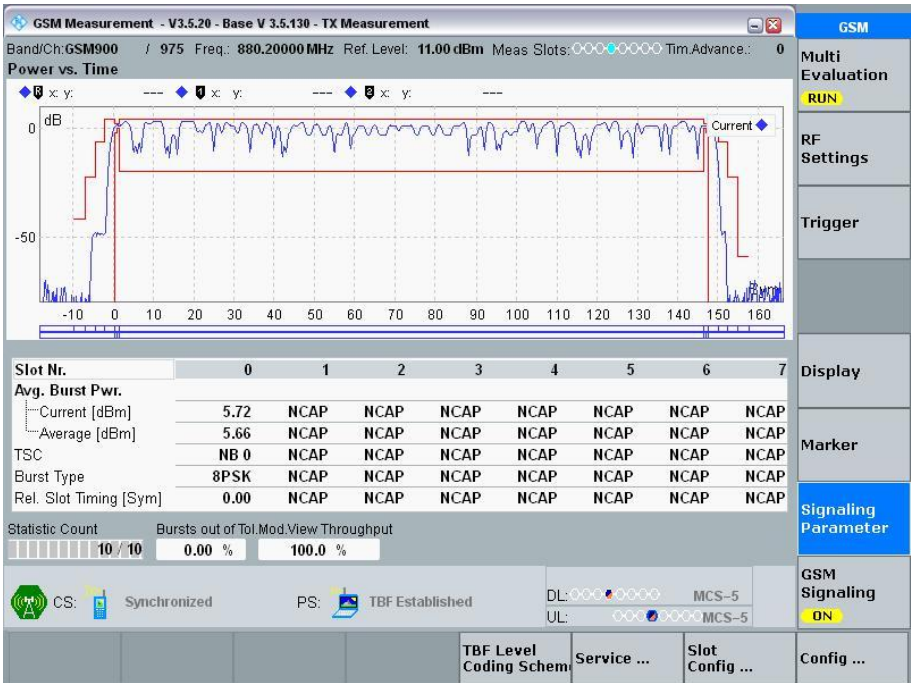
Normal Condition ( $\gamma=17$ ), Middle Channel



Normal Condition ( $\gamma=6$ ), Low Channel



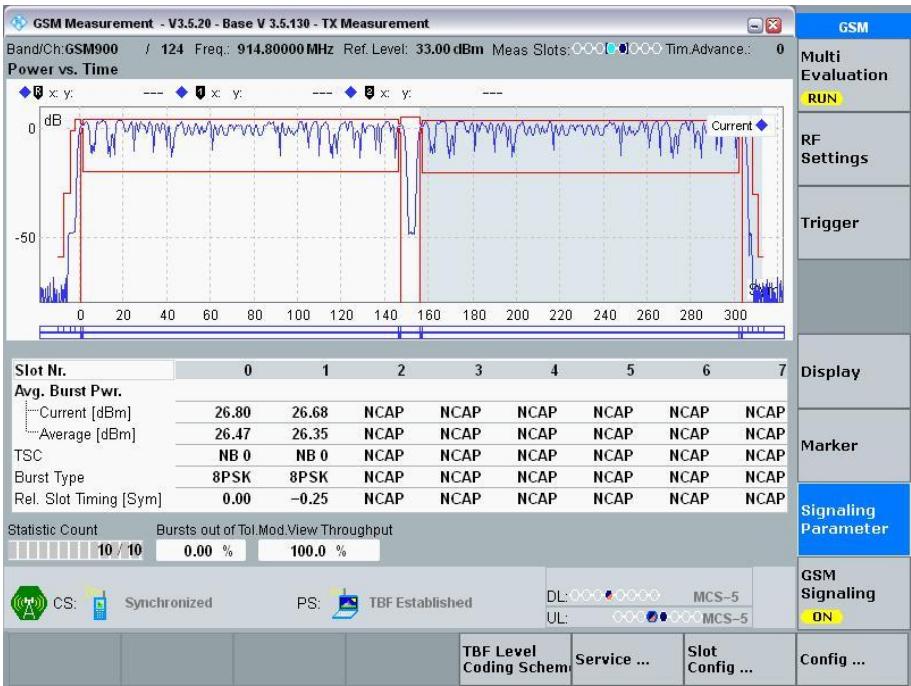
Normal Condition ( $\gamma=17$ ), Low Channel



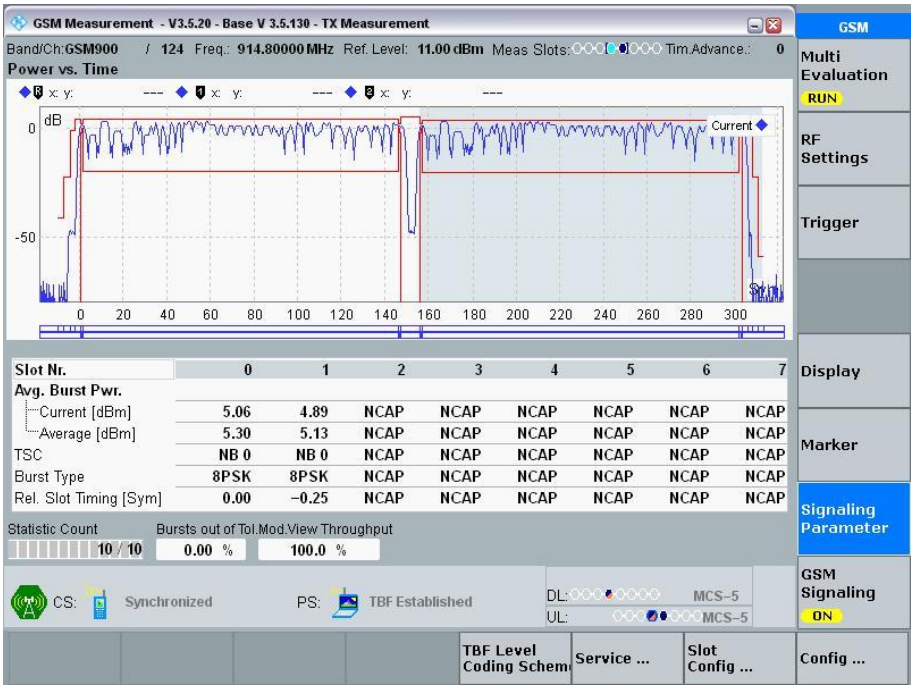


2 Uplink Slots

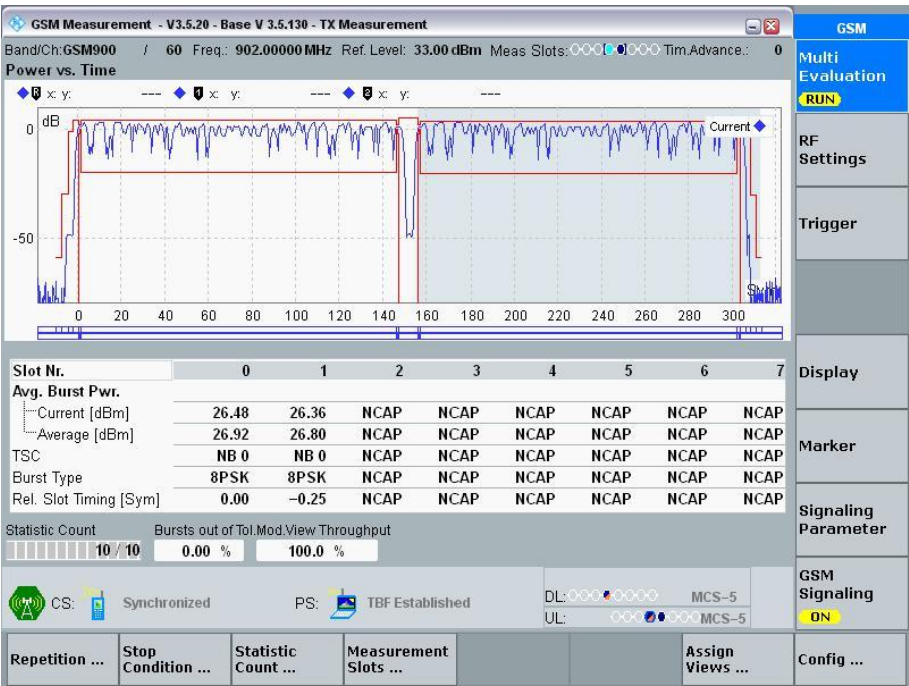
Normal Condition ( $\gamma=6$ ), High Channel



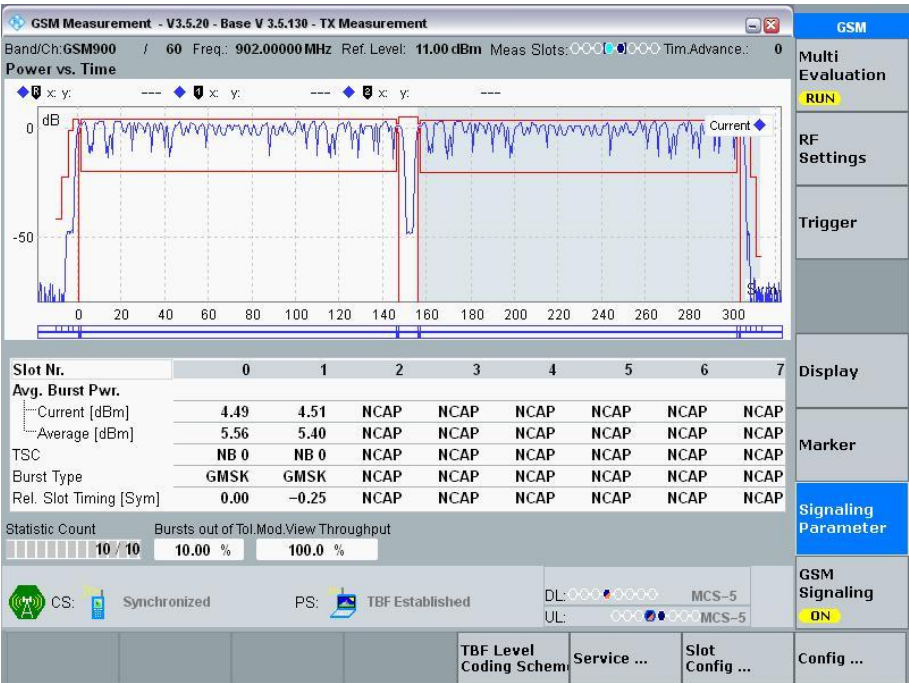
Normal Condition ( $\gamma=17$ ), High Channel



Normal Condition ( $\gamma=6$ ), Middle Channel

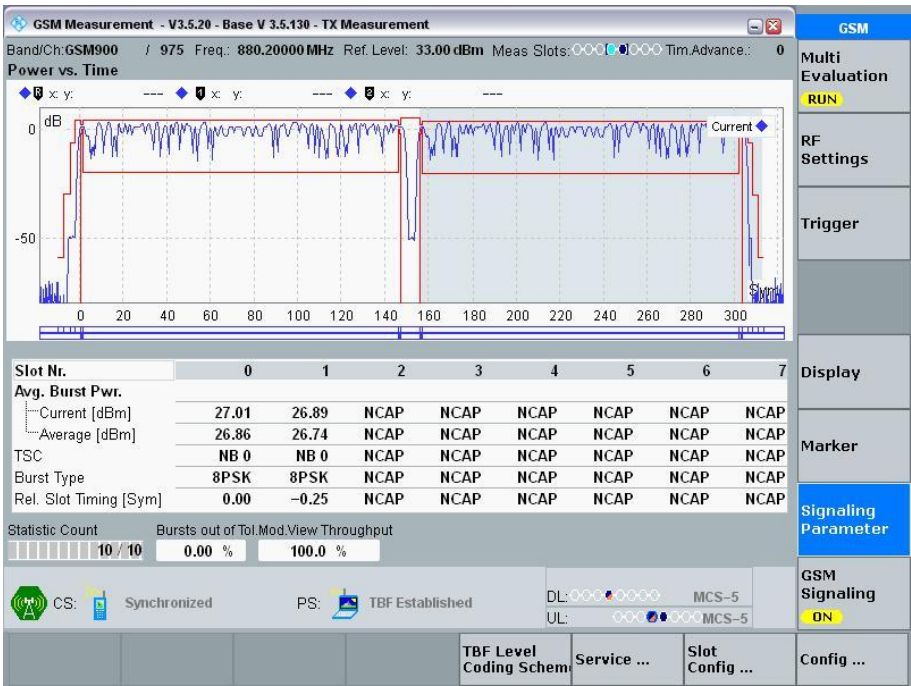


Normal Condition ( $\gamma=17$ ), Middle Channel

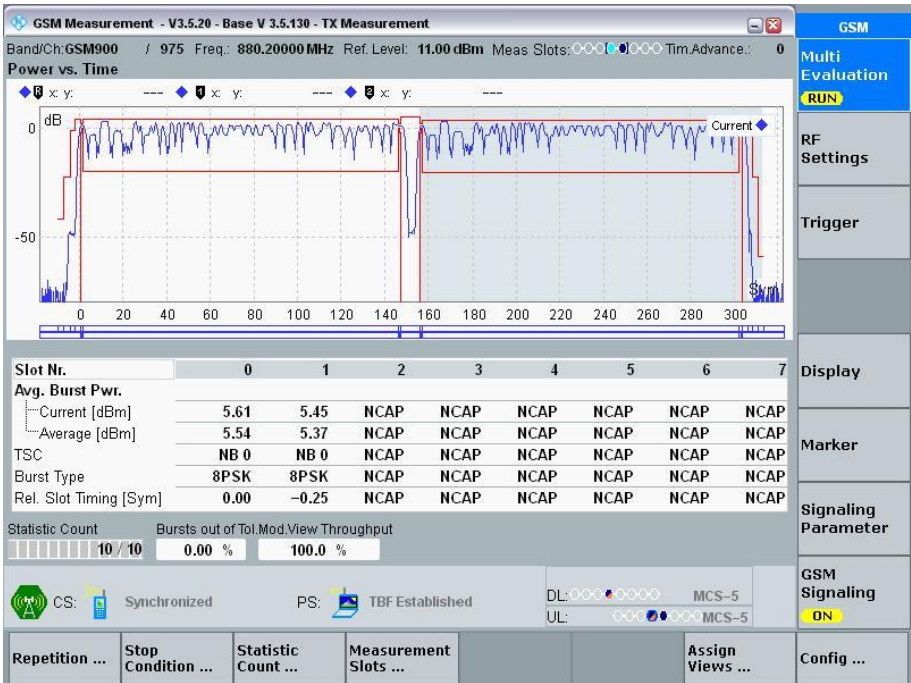




Normal Condition ( $\gamma=6$ ), Low Channel

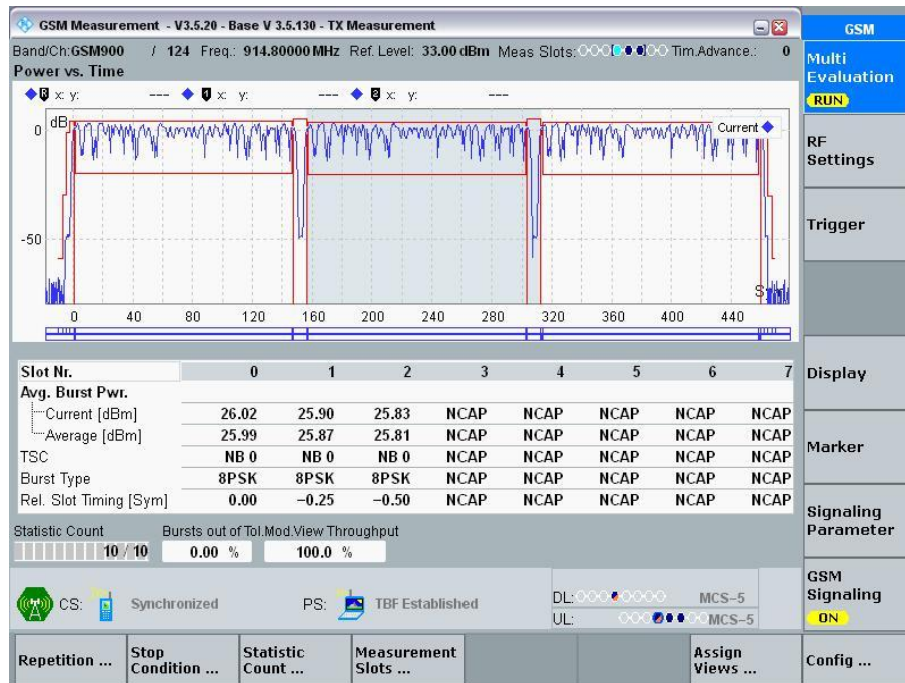


Normal Condition ( $\gamma=17$ ), Low Channel

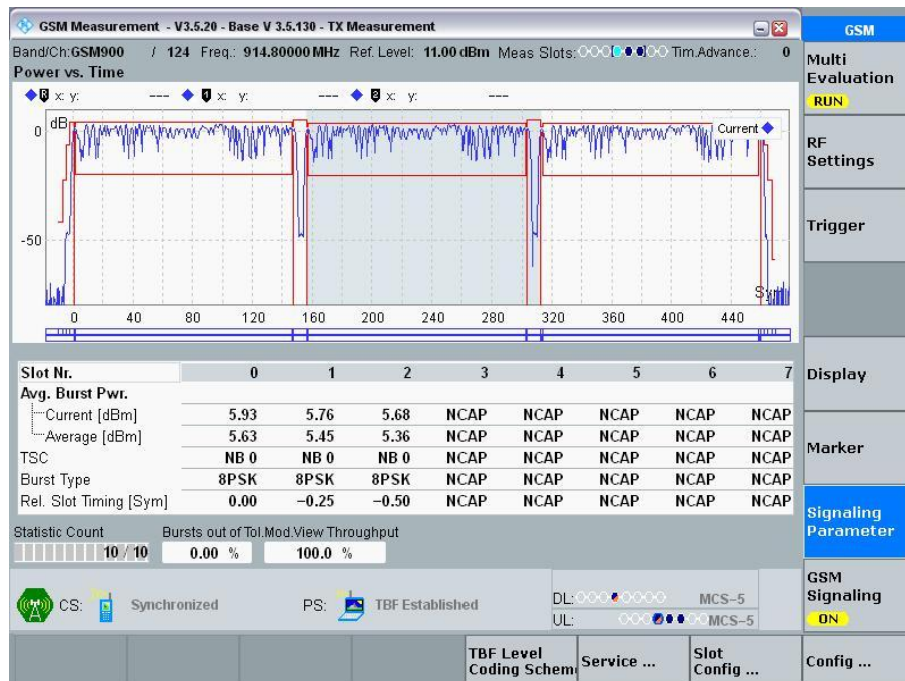


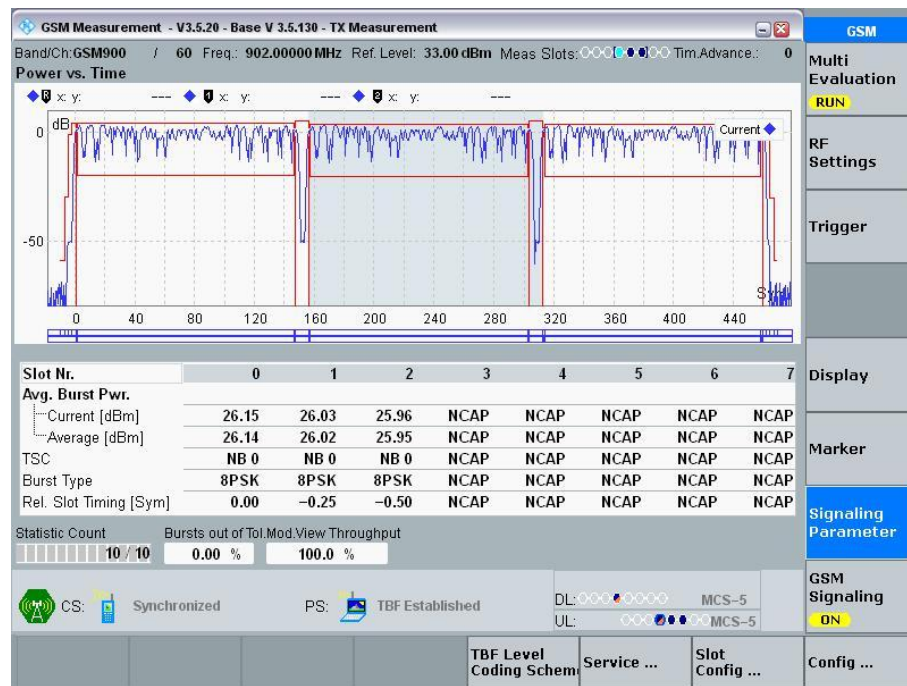
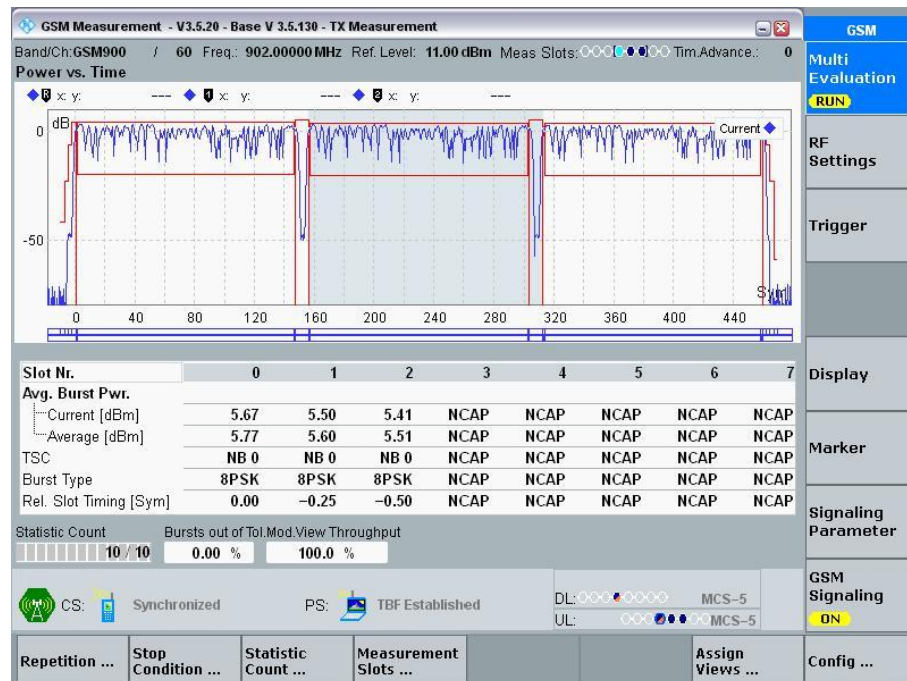
### 3 Uplink Slots

Normal Condition ( $\gamma=6$ ), High Channel

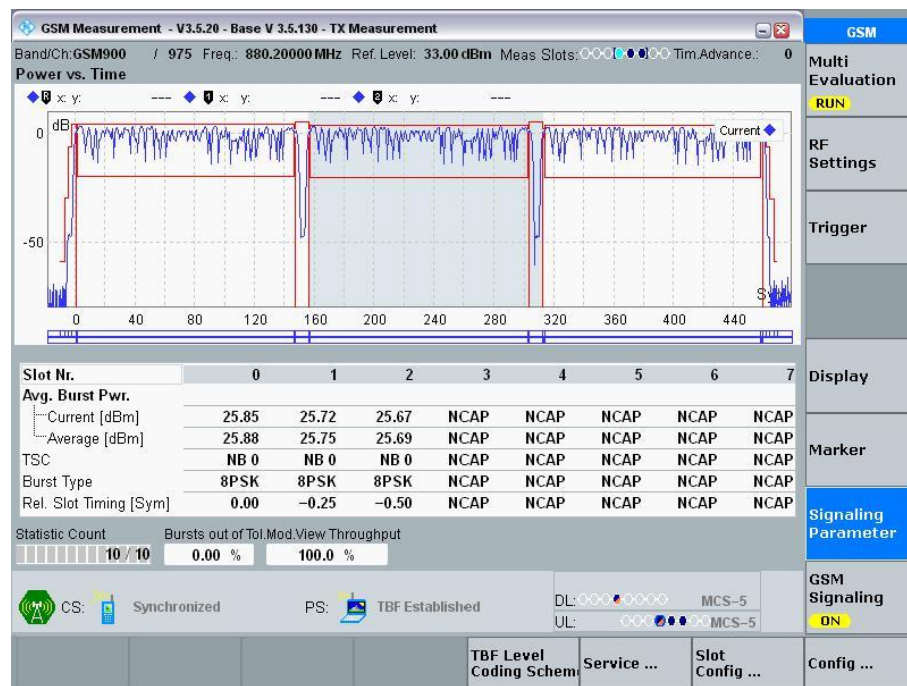
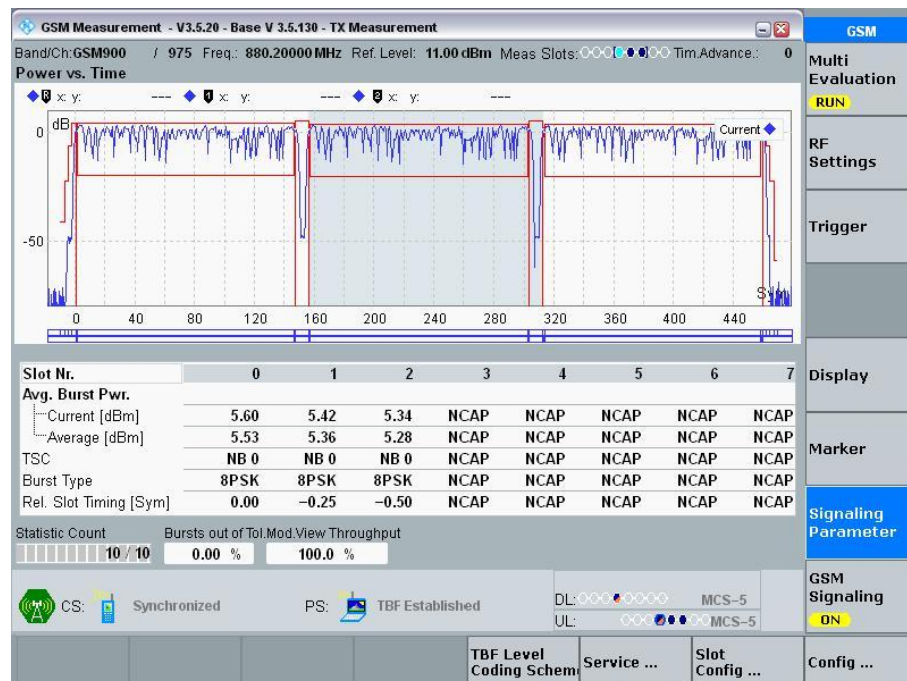


Normal Condition ( $\gamma=17$ ), High Channel



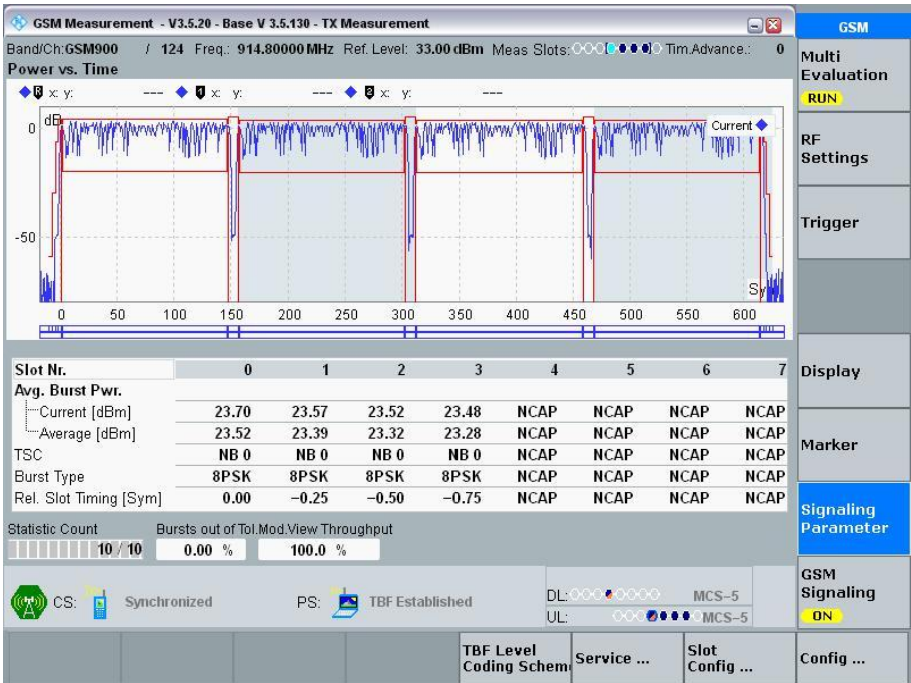
Normal Condition ( $\gamma=6$ ), Middle ChannelNormal Condition ( $\gamma=17$ ), Middle Channel



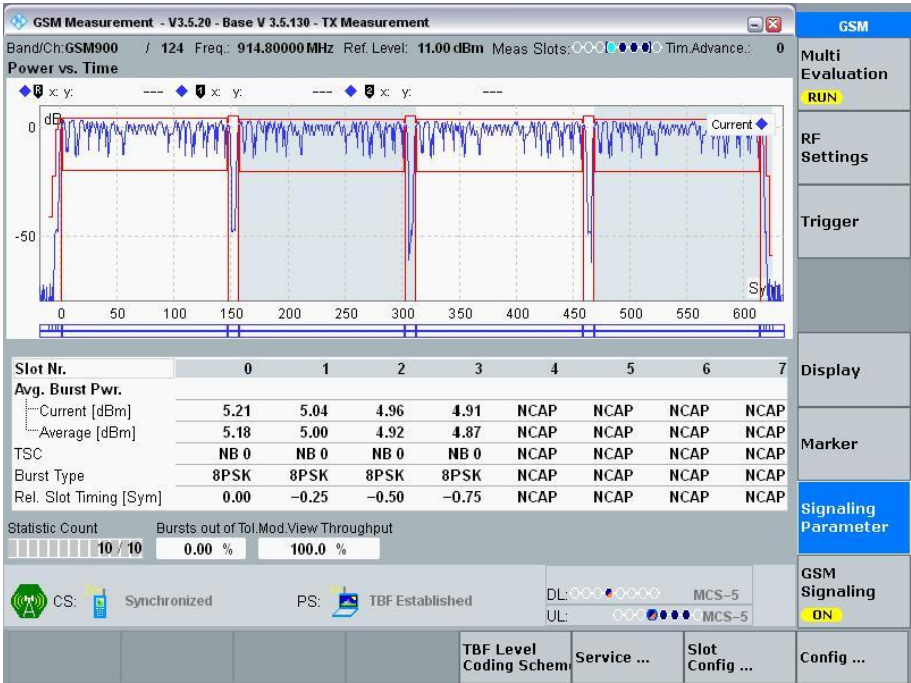
Normal Condition ( $\gamma=6$ ), Low ChannelNormal Condition ( $\gamma=17$ ), Low Channel

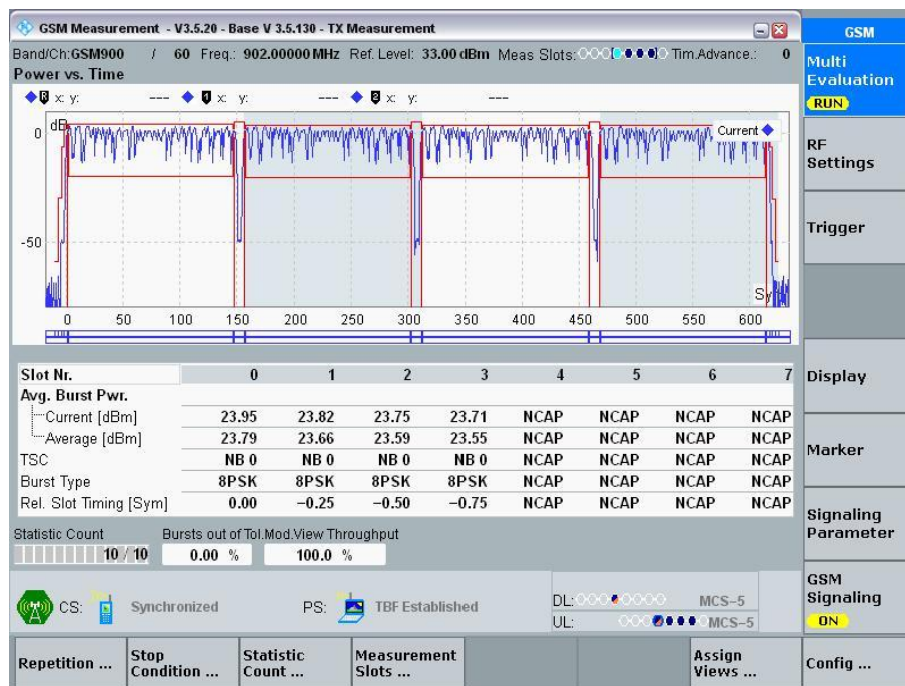
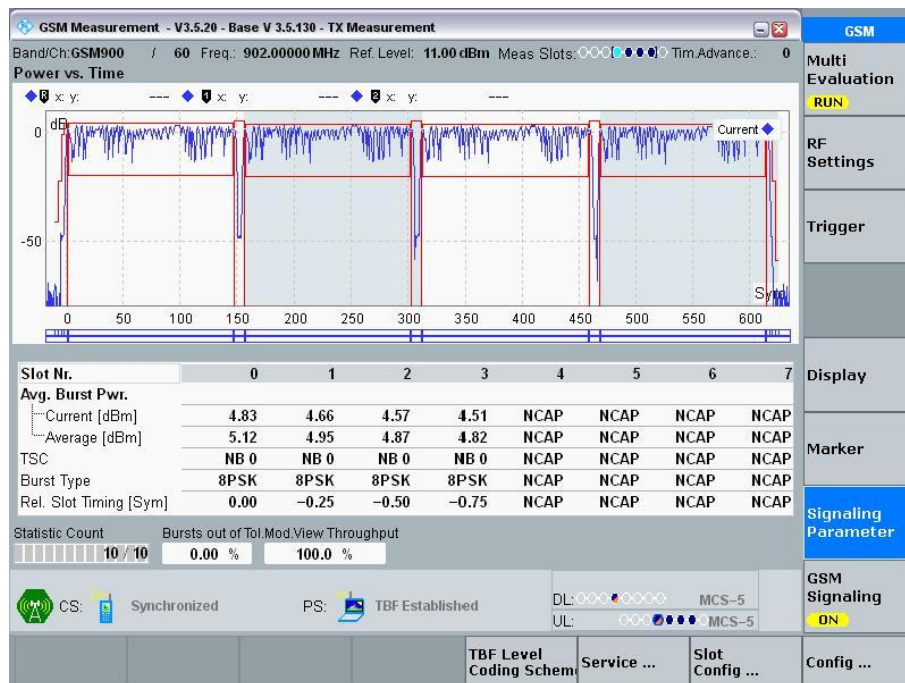
4 Uplink Slots

Normal Condition ( $\gamma=6$ ), High Channel

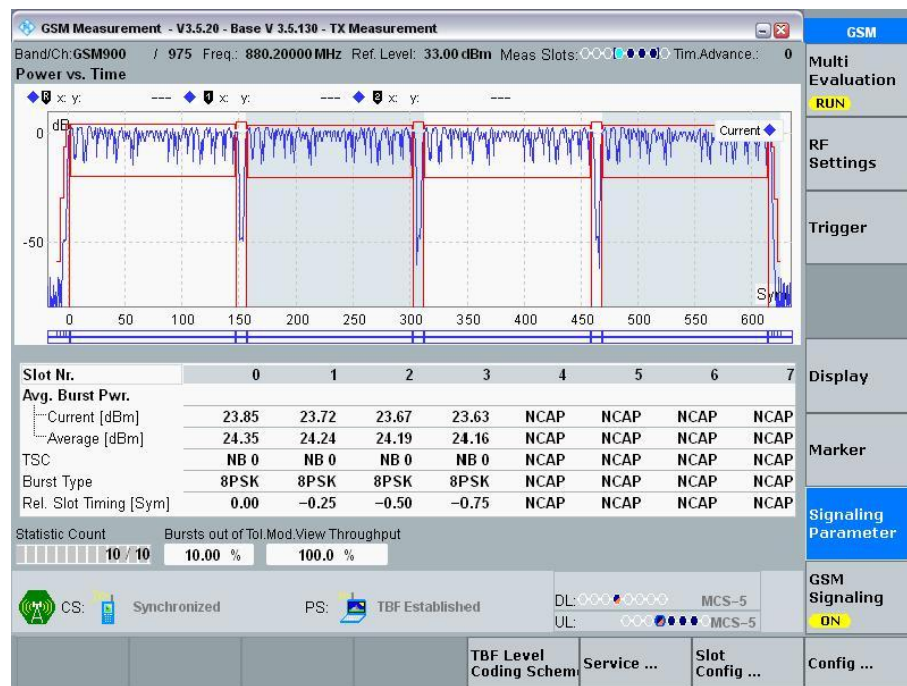
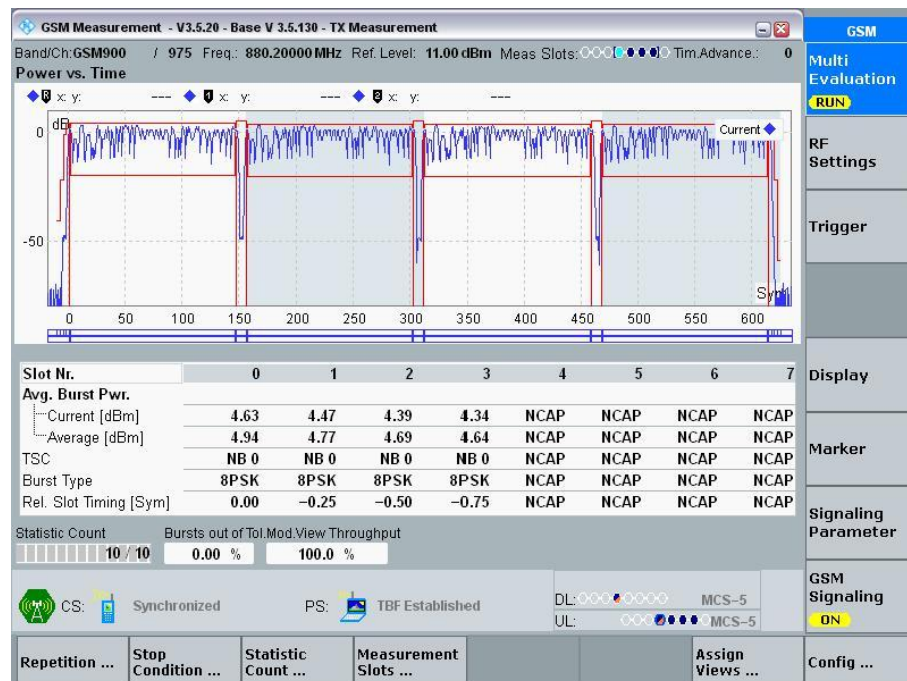


Normal Condition ( $\gamma=17$ ), High Channel



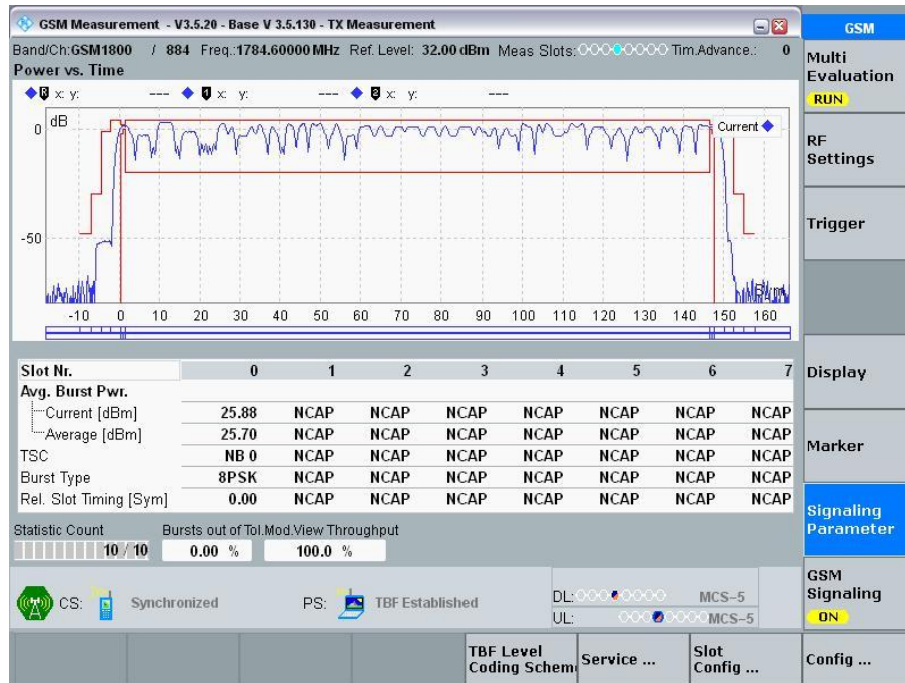
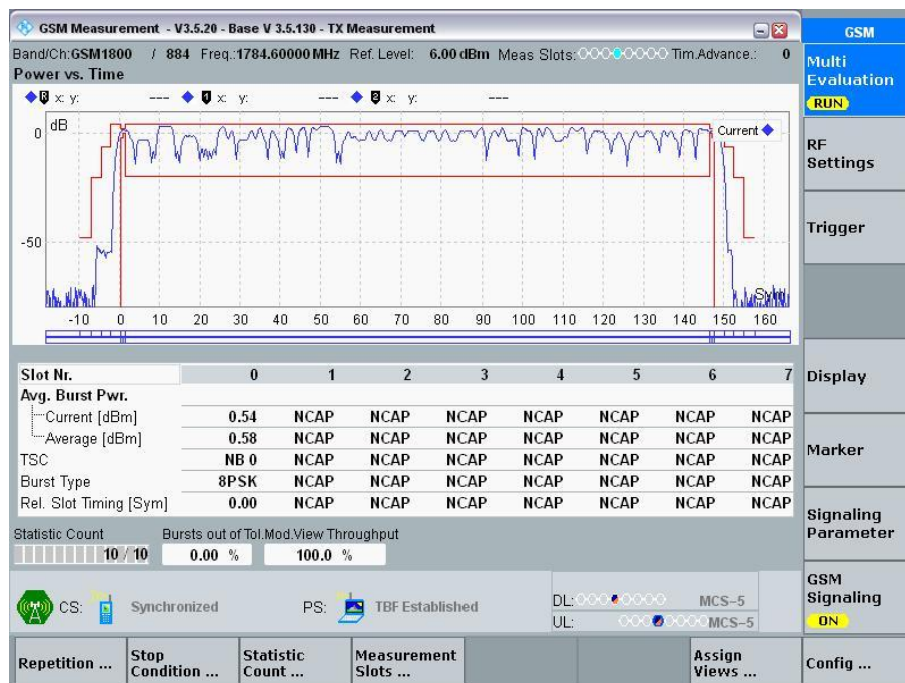
Normal Condition ( $\gamma=6$ ), Middle ChannelNormal Condition ( $\gamma=17$ ), Middle Channel



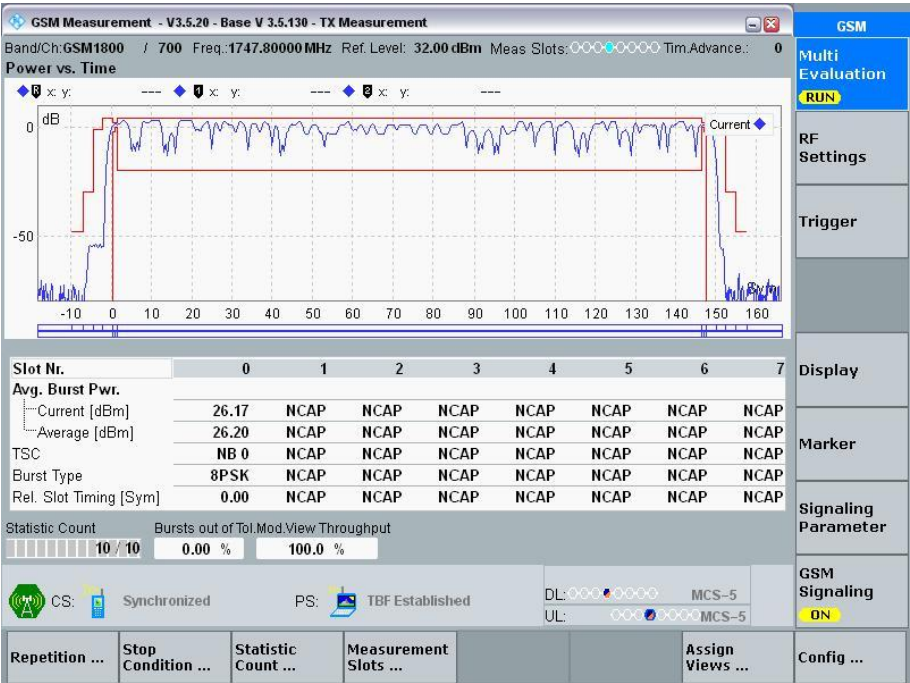
Normal Condition ( $\gamma=6$ ), Low ChannelNormal Condition ( $\gamma=17$ ), Low Channel

**EGPRS 1800 output power**

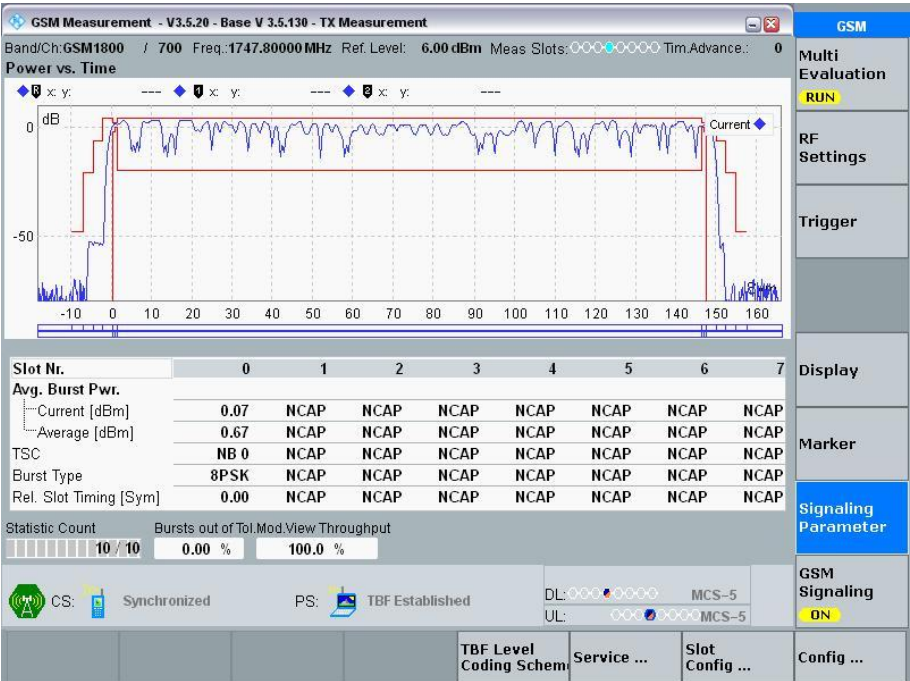
Power Control Level	Output power (dBm)			Result
	Low Channel	Middle Channel	High Channel	
1 uplink slot				Pass
5	26.25	26.20	25.70	
6	24.15	24.42	23.18	
7	21.90	21.96	21.22	
8	19.22	19.82	19.79	
9	17.45	17.29	17.06	
10	16.29	15.35	15.41	
11	13.62	13.01	13.00	
12	11.10	11.82	11.35	
13	10.72	9.97	9.73	
14	7.91	7.72	7.18	
15	5.53	5.48	5.32	
16	3.76	3.68	3.59	
17	1.38	1.85	1.46	
18	0.96	0.67	0.58	
2 uplink slots				
5	25.87	25.76	25.43	
18	0.50	0.35	0.15	
3 uplink slots				
5	25.04	25.17	24.63	
18	0.39	0.29	0.15	
4 uplink slots				
5	23.55	23.38	22.75	
18	0.86	0.54	0.56	

**Normal Condition:****EGPRS 1800:****1 Uplink Slot**Normal Condition ( $\gamma=5$ ), High ChannelNormal Condition ( $\gamma=18$ ), High Channel

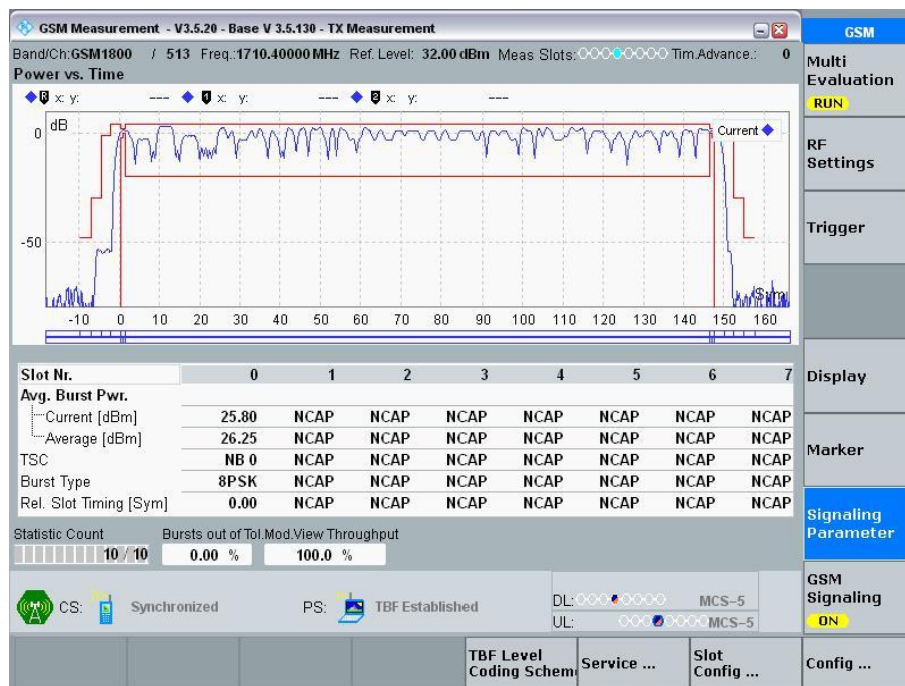
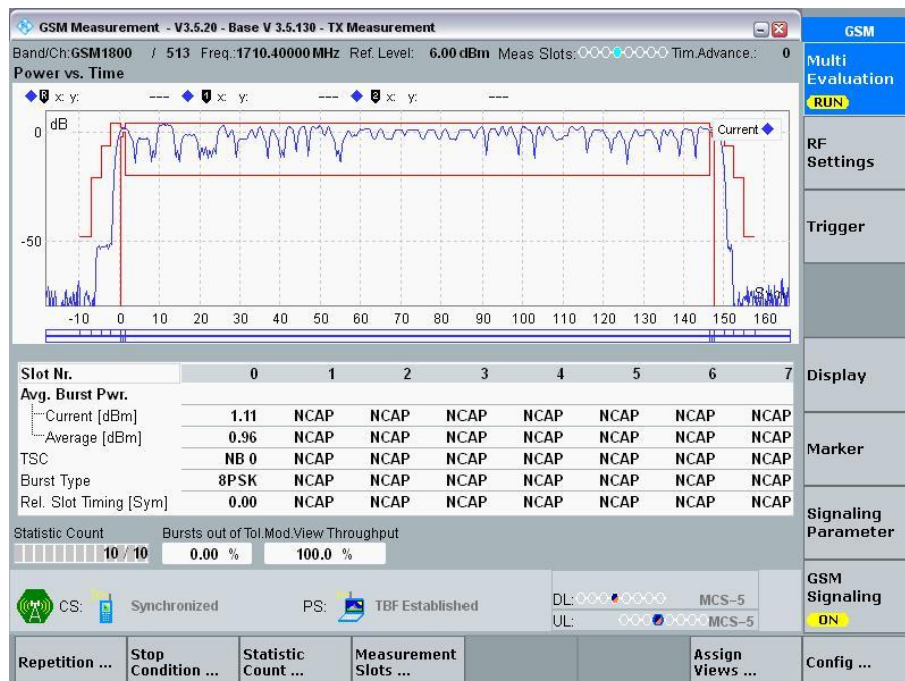
Normal Condition ( $\gamma=5$ ), Middle Channel



Normal Condition ( $\gamma=18$ ), Middle Channel



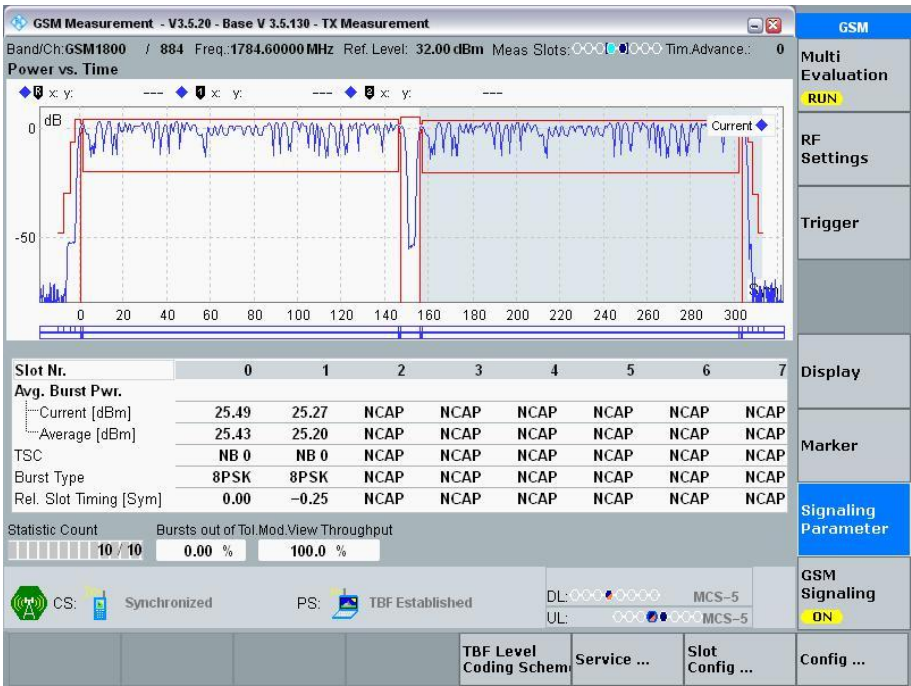


Normal Condition ( $\gamma=5$ ), Low ChannelNormal Condition ( $\gamma=18$ ), Low Channel

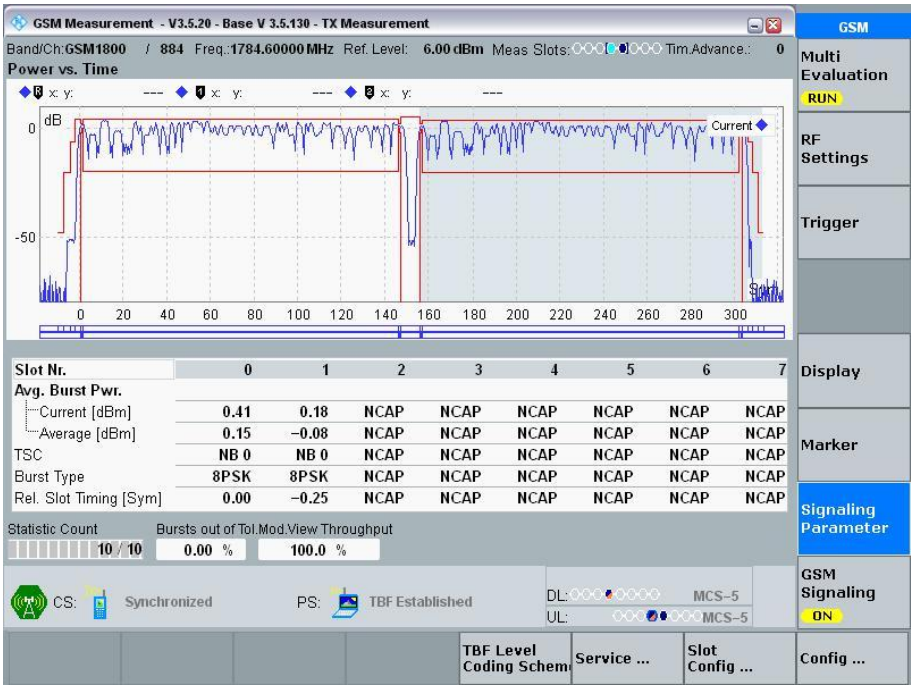


2 Uplink Slots

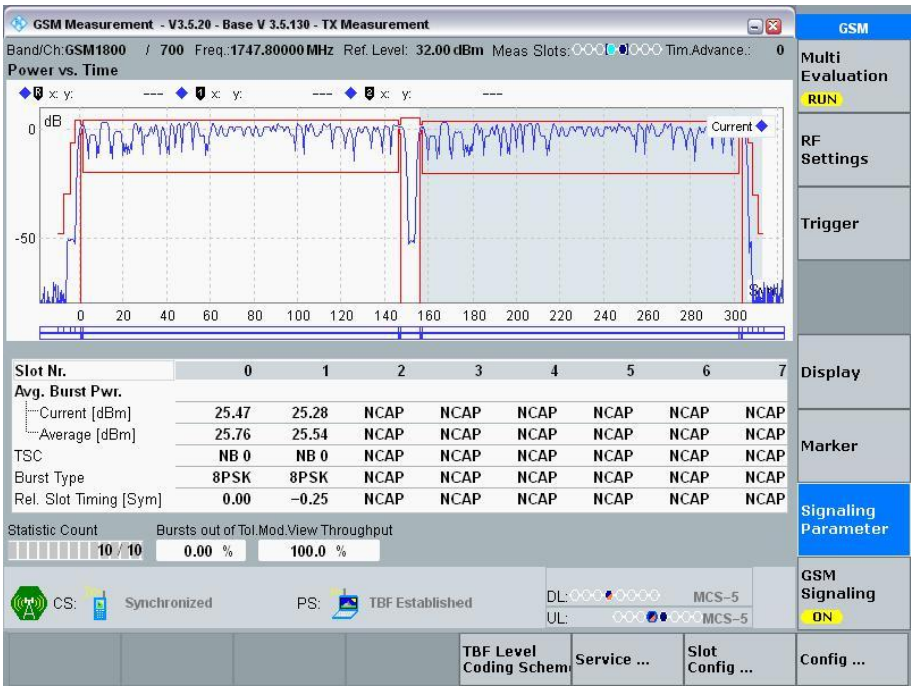
Normal Condition ( $\gamma=5$ ), High Channel



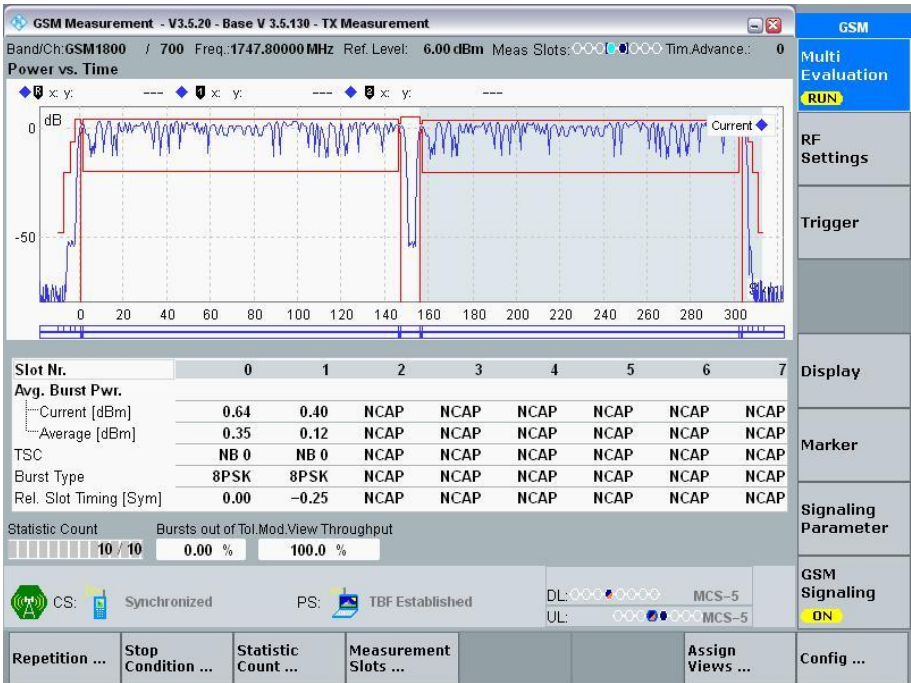
Normal Condition ( $\gamma=18$ ), High Channel



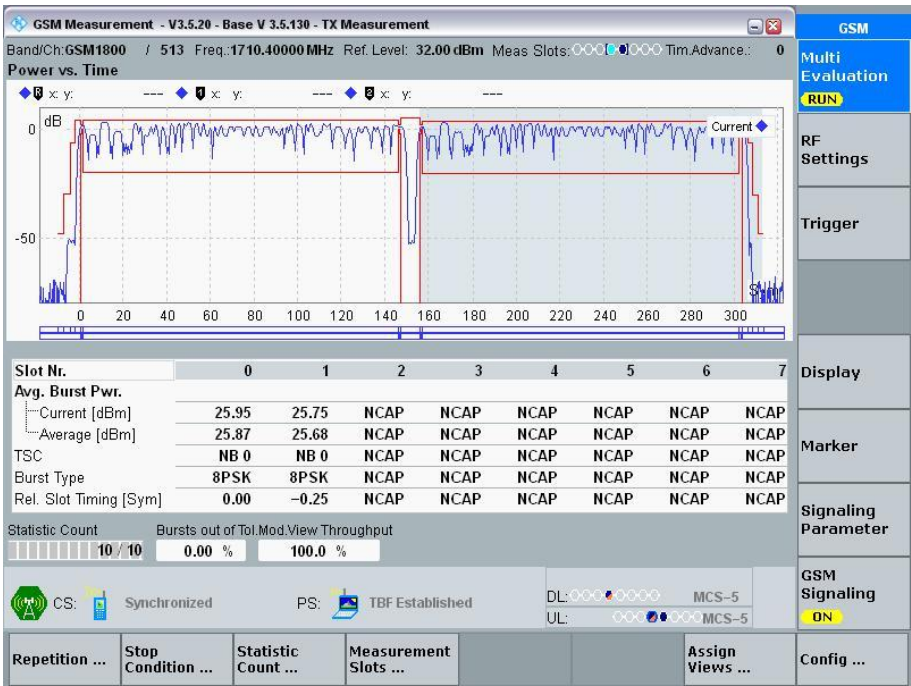
Normal Condition ( $\gamma=5$ ), Middle Channel



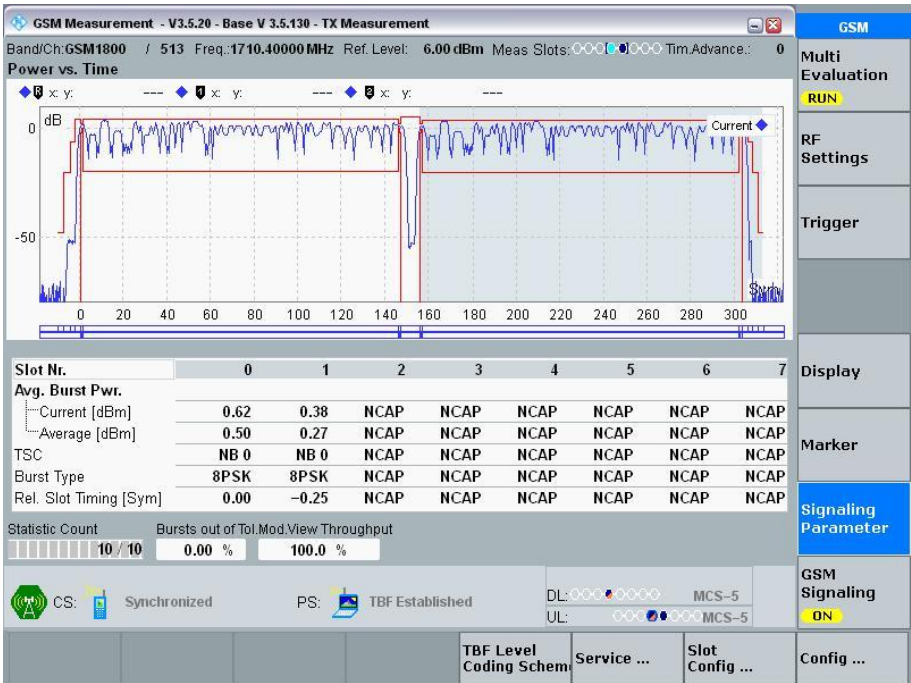
Normal Condition ( $\gamma=18$ ), Middle Channel



Normal Condition ( $\gamma=5$ ), Low Channel



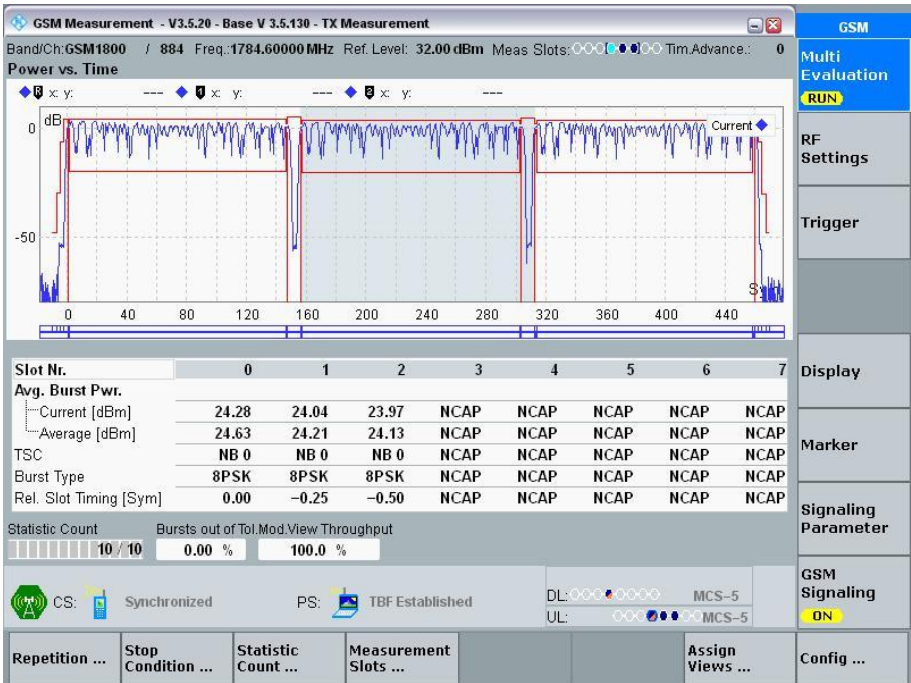
Normal Condition ( $\gamma=18$ ), Low Channel



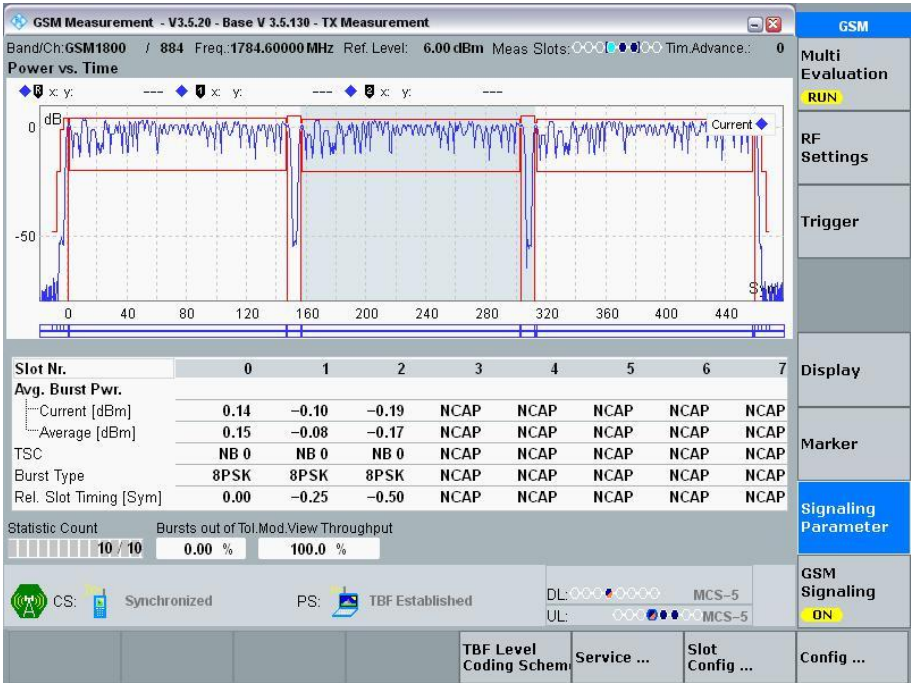


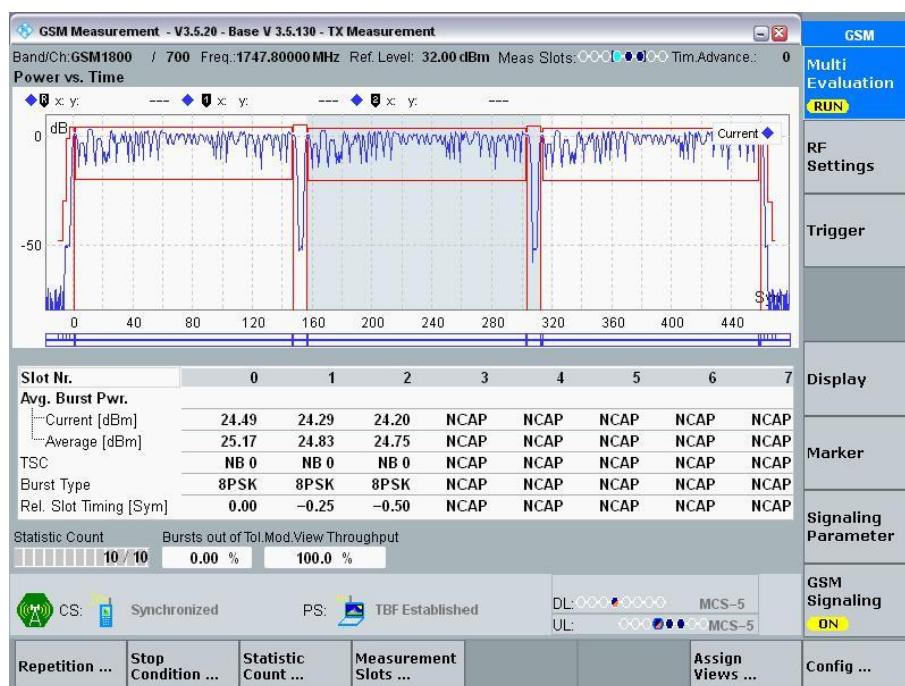
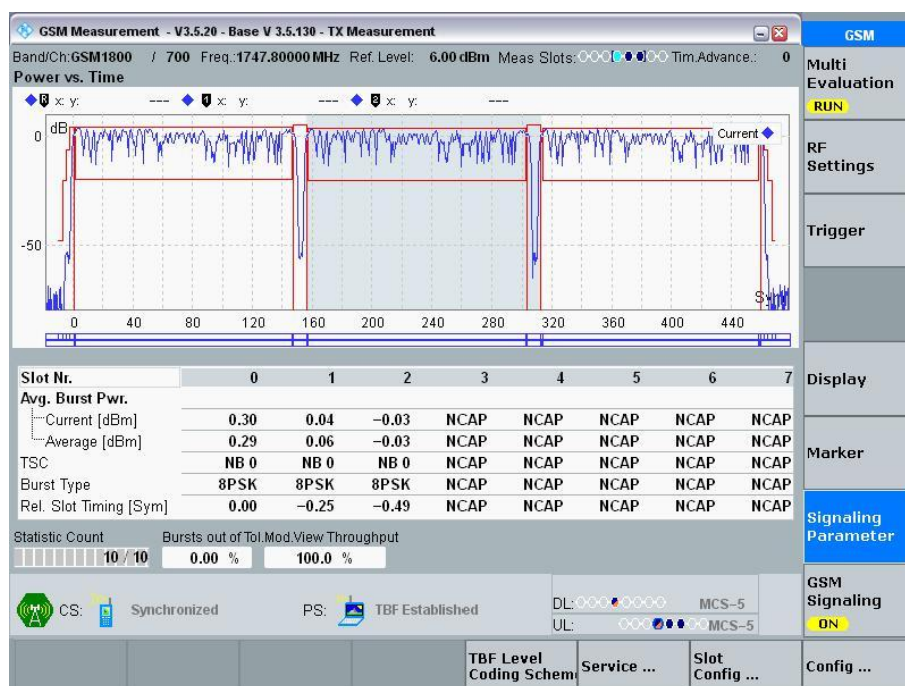
3 Uplink Slots

Normal Condition ( $\gamma=5$ ), High Channel

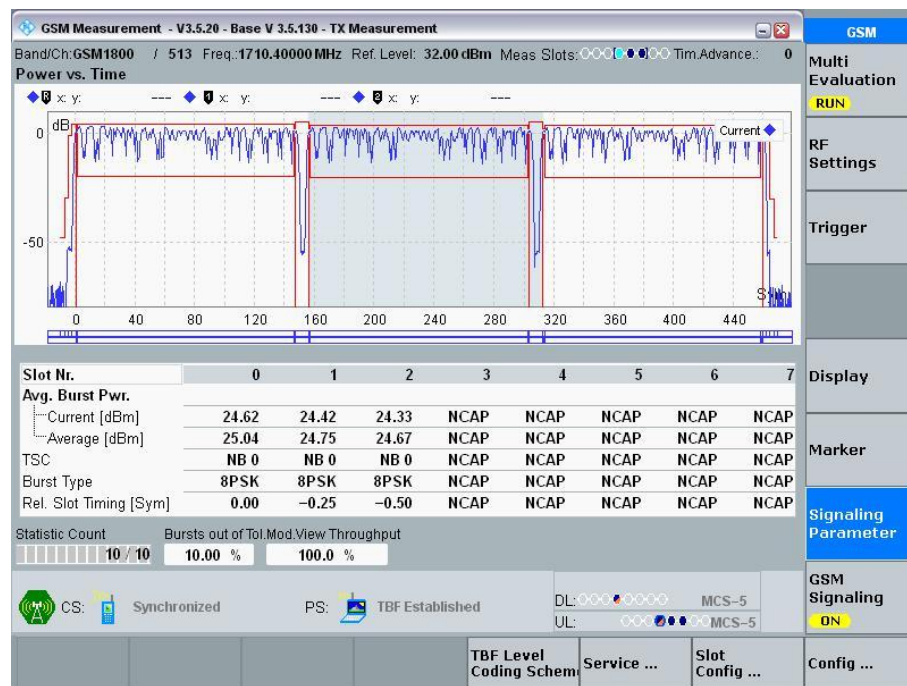
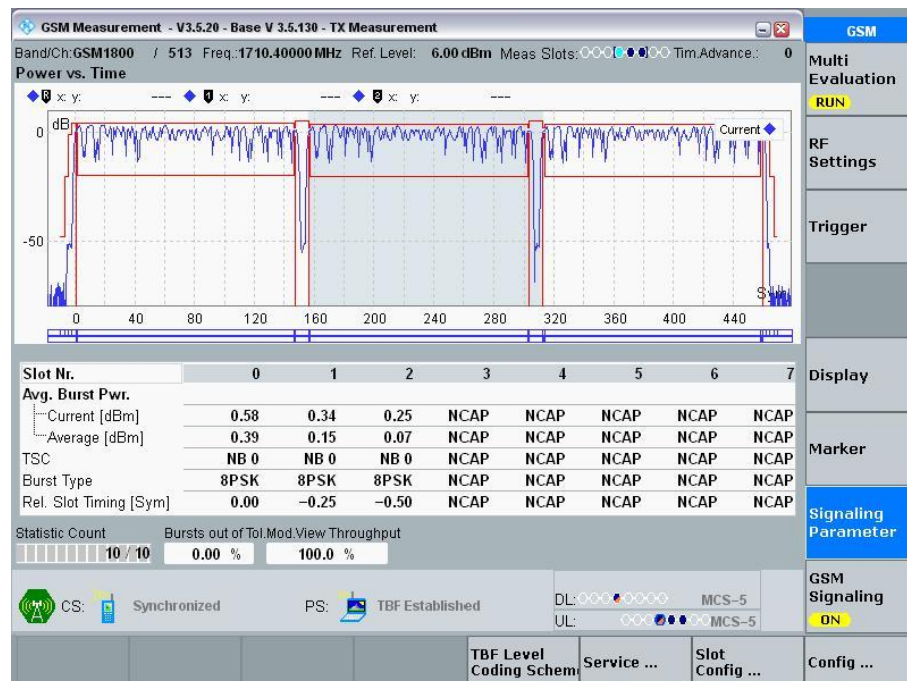


Normal Condition ( $\gamma=18$ ), High Channel



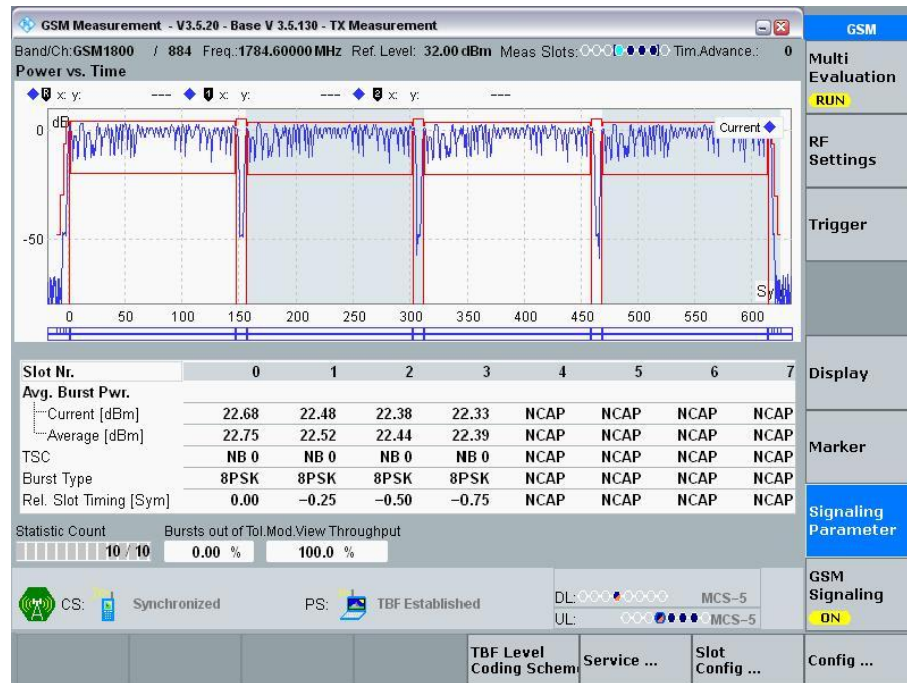
Normal Condition ( $\gamma=5$ ), Middle ChannelNormal Condition ( $\gamma=18$ ), Middle Channel



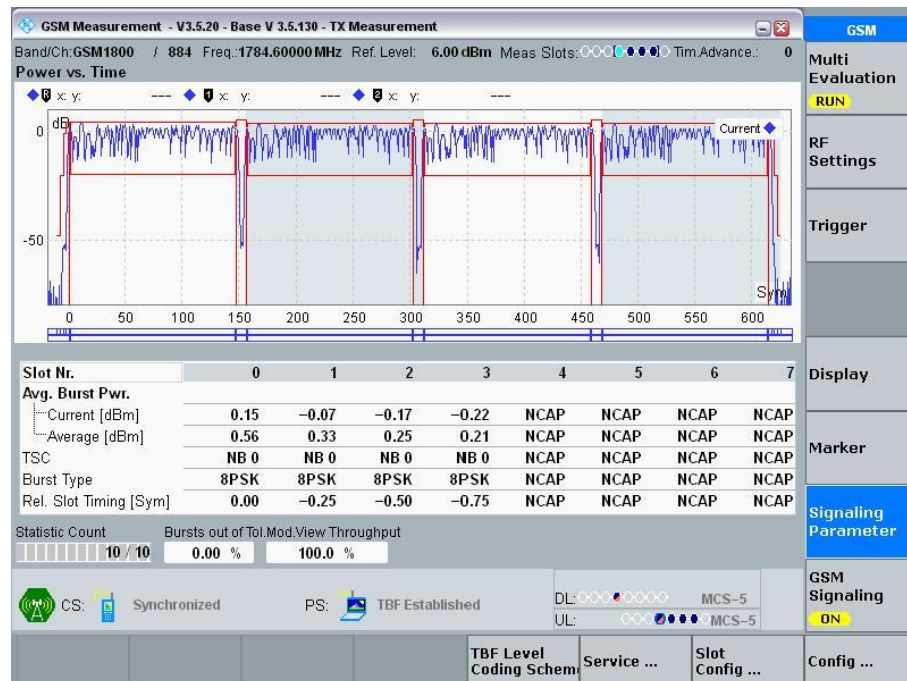
Normal Condition ( $\gamma=5$ ), Low ChannelNormal Condition ( $\gamma=18$ ), Low Channel

## 4 Uplink Slots

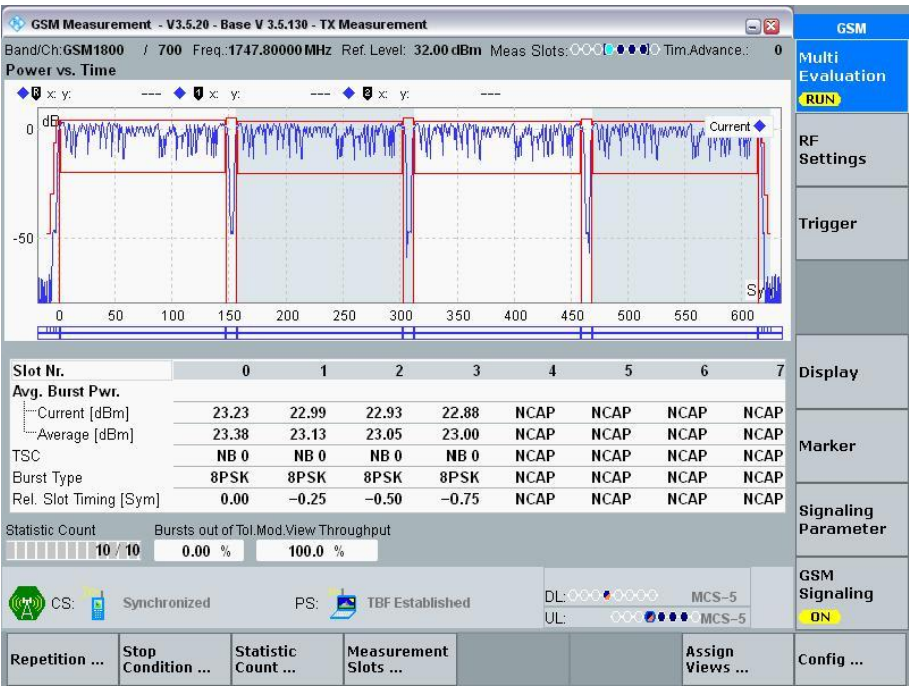
Normal Condition ( $\gamma=5$ ), High Channel



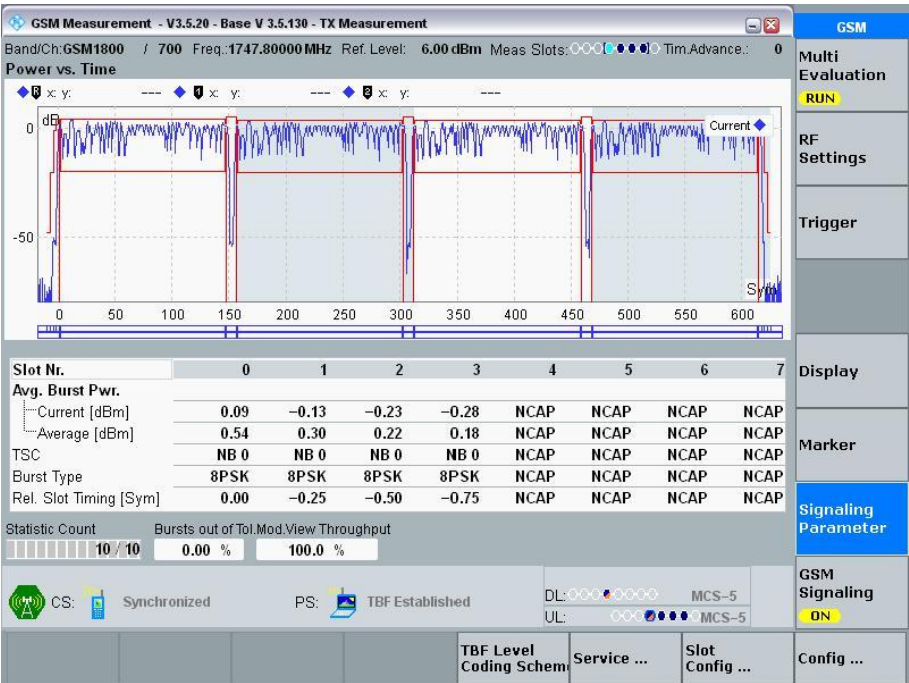
Normal Condition ( $\gamma=18$ ), High Channel



Normal Condition ( $\gamma=5$ ), Middle Channel

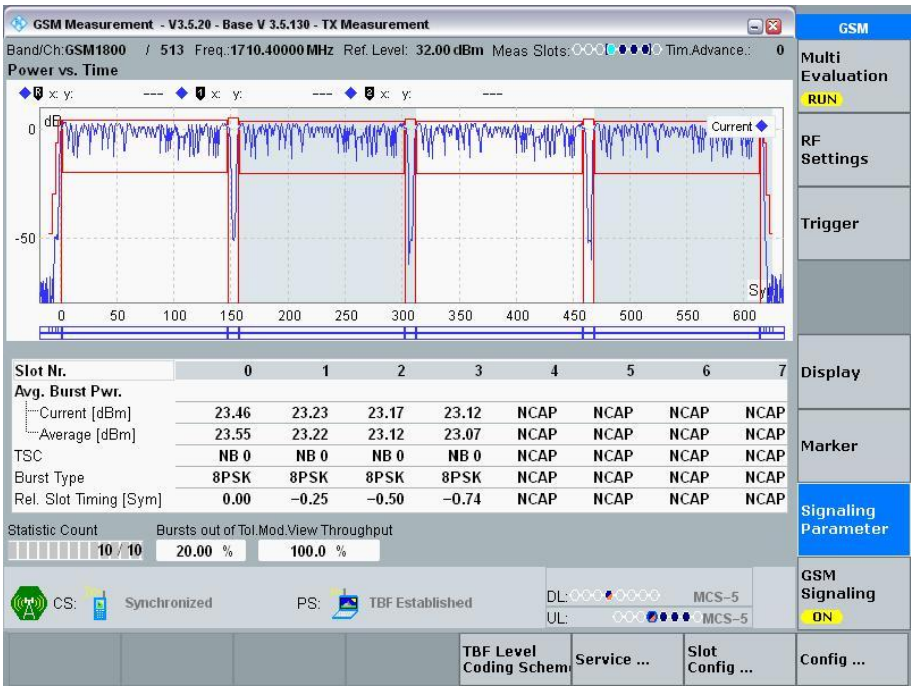


Normal Condition ( $\gamma=18$ ), Middle Channel

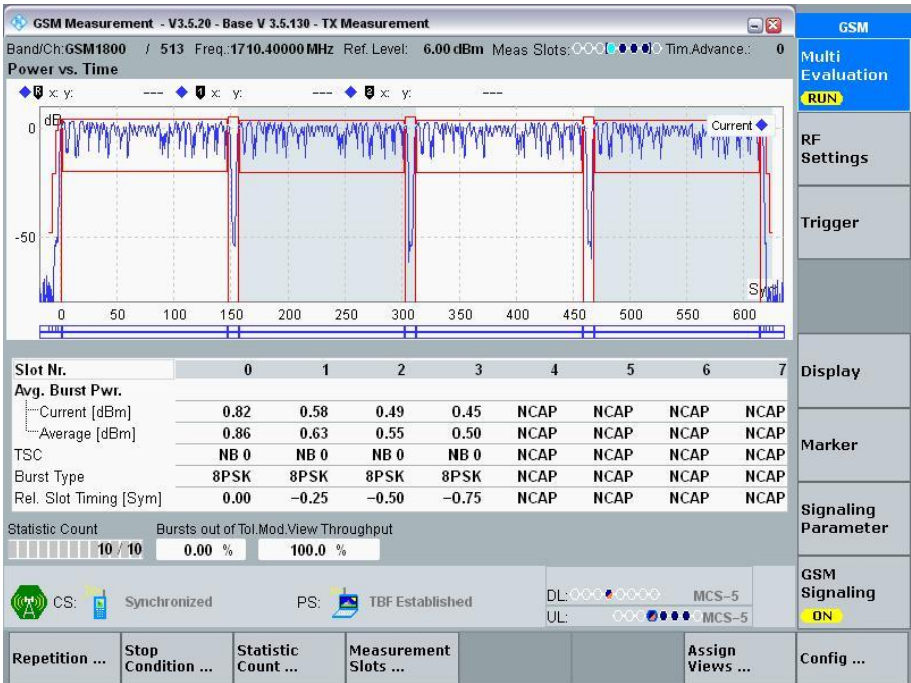




Normal Condition ( $\gamma=5$ ), Low Channel



Normal Condition ( $\gamma=18$ ), Low Channel



## §4.2.29- OUTPUT RF SPECTRUM IN EGPRS CONFIGURATION

### Applicable Standard

According to Per EN 301 511 V12.5.1 (2017-03), section 4.2.29,

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 200 kHz 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.
- 1.3 Under normal conditions; 3GPP TS 05.05, subclause 4.2.1.
- 1.4 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.1; 3GPP TS 05.05, annex D subclauses D.2.1 and D.2.2.
2. The level of the output RF spectrum due to switching transients shall be no more than given in 3GPP TS 05.05, subclause 4.2.2, table "a) Mobile Station".
  - 2.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.2.
  - 2.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.2; 3GPP TS 05.05 annex D subclause D.2.1 and D.2.2.
3. When allocated a channel, the power emitted by a GSM 400, GSM 900 and DCS 1 800 MS, in the band 935 MHz to 960 MHz shall be no more than -79 dBm, in the band 925 MHz to 935 MHz shall be no more than -67 dBm and in the band 1 805 MHz to 1 880 MHz shall be no more than -71 dBm except in five measurements in each of the bands 925 MHz to 960 MHz and 1 805 MHz to 1 880 MHz where exceptions at up to -36 dBm are permitted. For GSM 400 MS, in addition, the power emitted by MS, in the bands of 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz shall be no more than -67 dBm except in three measurements in each of the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz where exceptions at up to -36 dBm are permitted. For GSM 700 and GSM 850, the power emitted by MS, in the band of 747 MHz to 757 MHz shall be no more than -79 dBm, in the band of 757 MHz to 762 MHz shall be no more than -73 dBm, in the band 869 MHz to 894 MHz shall be no more than -79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71 dBm except in five measurements in each of the bands 747 MHz to 762 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to -36 dBm are permitted. For PCS 1 900 MS, the power emitted by MS, in the band 869 MHz to 894 MHz shall be no more than -79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71 dBm except in five measurements in each of the bands 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to -36 dBm are permitted. Under normal conditions; 3GPP TS 05.05, subclause 4.3.3.



**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 to 763		-73
869 to 894		-79
1930 to 1990		-71

## 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.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

**Test Results:** Pass.

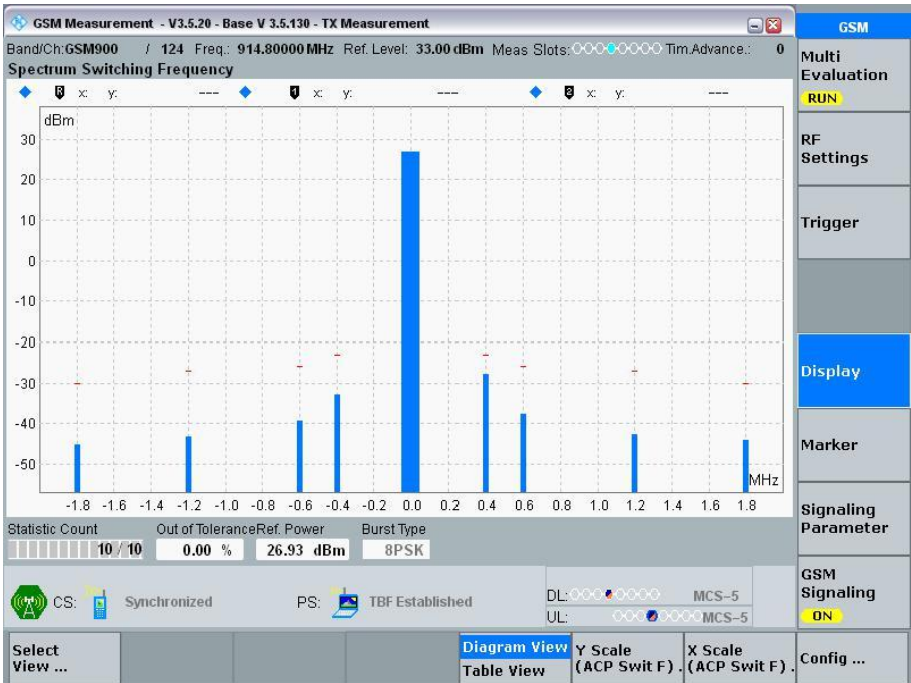
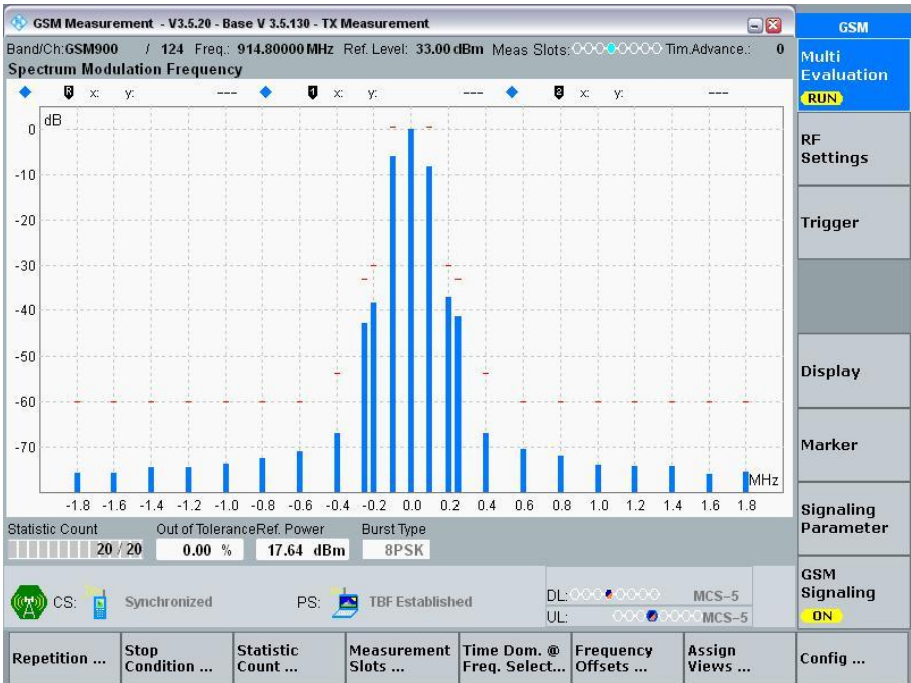
Please see the following table and plots:

Mode	Test Channel	Test Condition					Result
EGPRS 900	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
EGPRS 1800	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

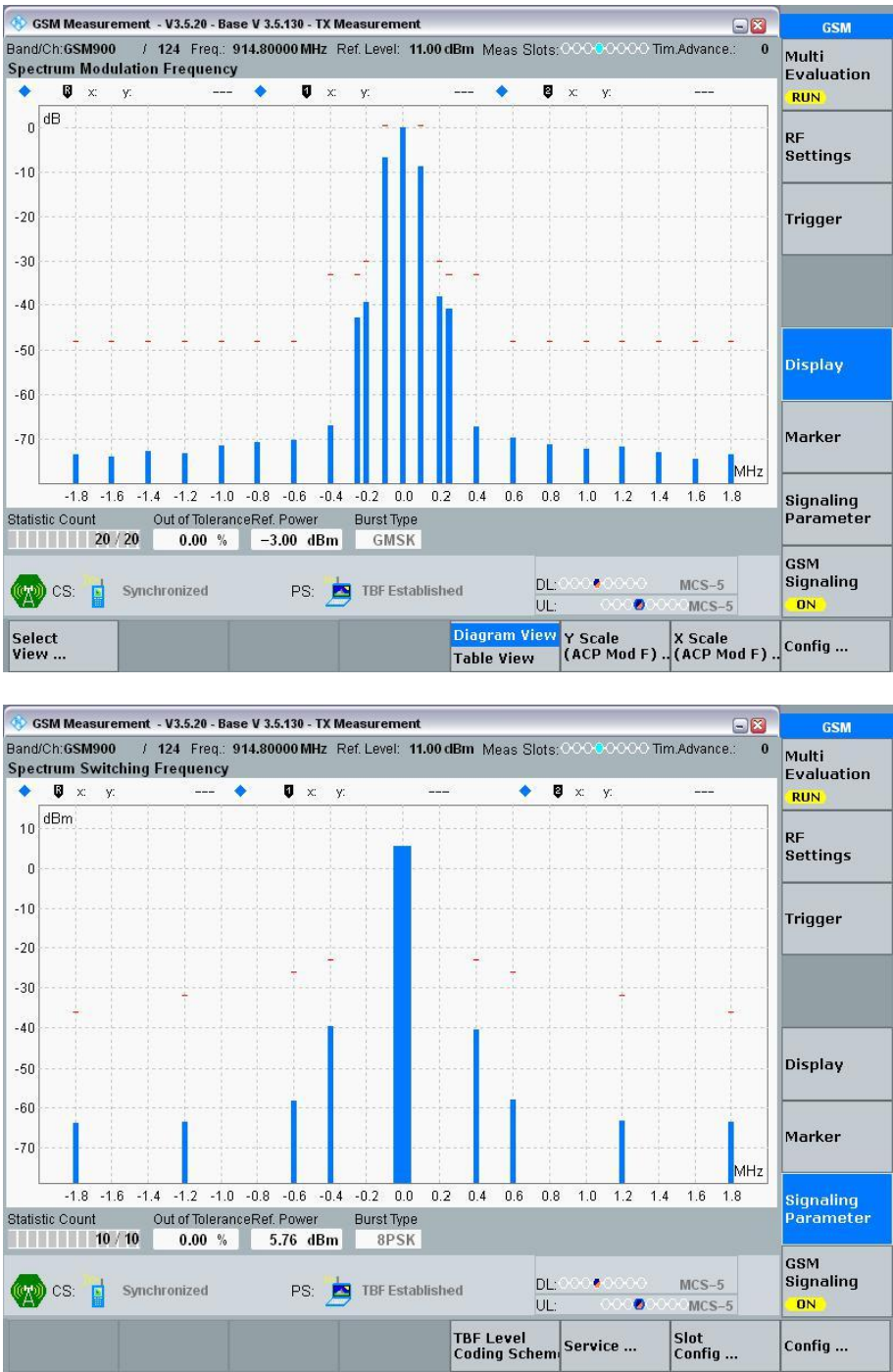
**Normal Condition Test Data as below:**

EGPRS 900:

Normal Condition ( $\gamma=6$ ), High Channel

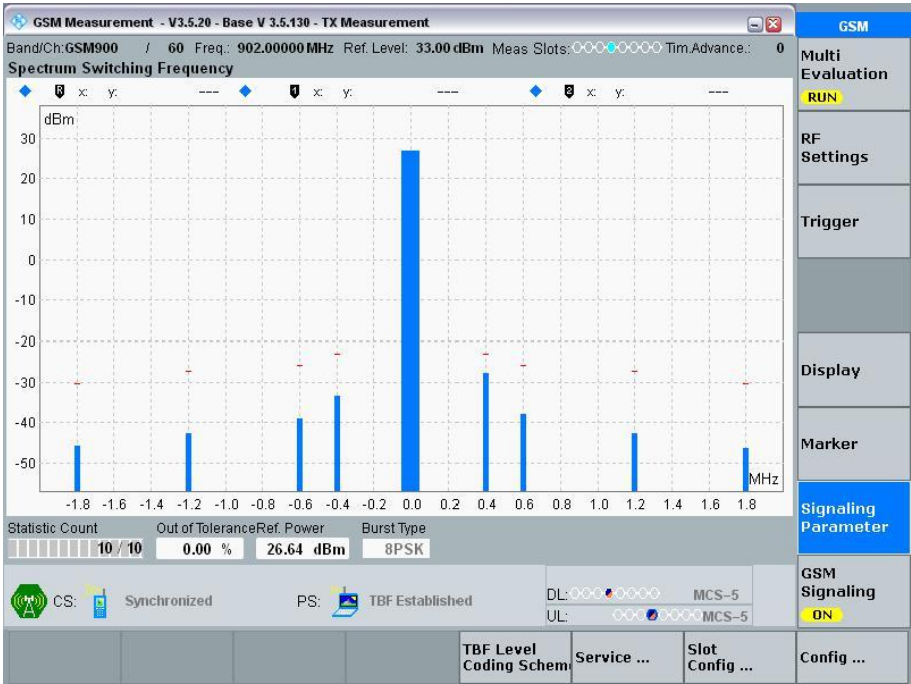
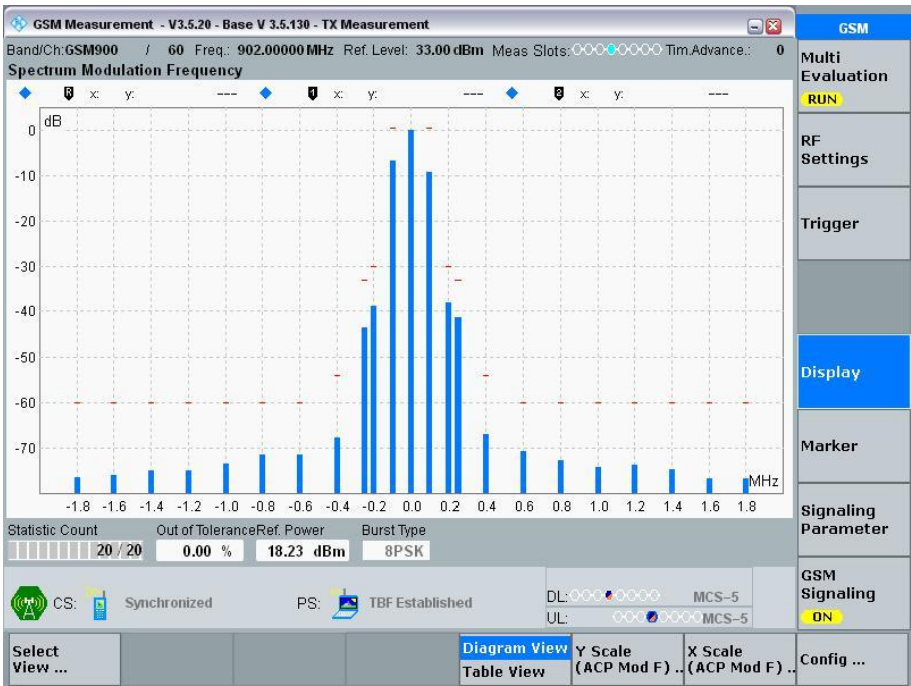


Normal Condition ( $\gamma=17$ ), High Channel

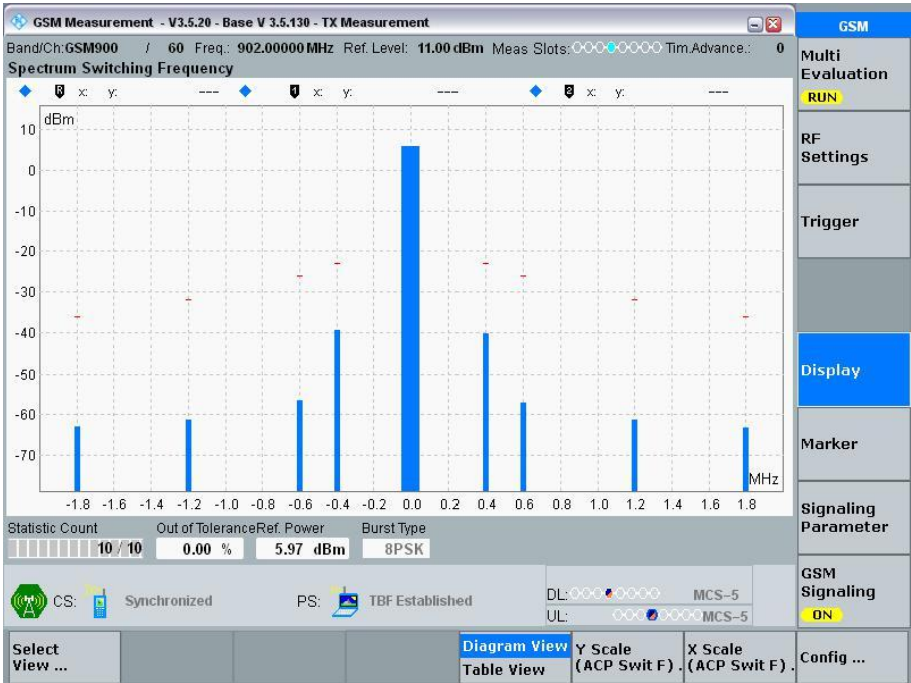
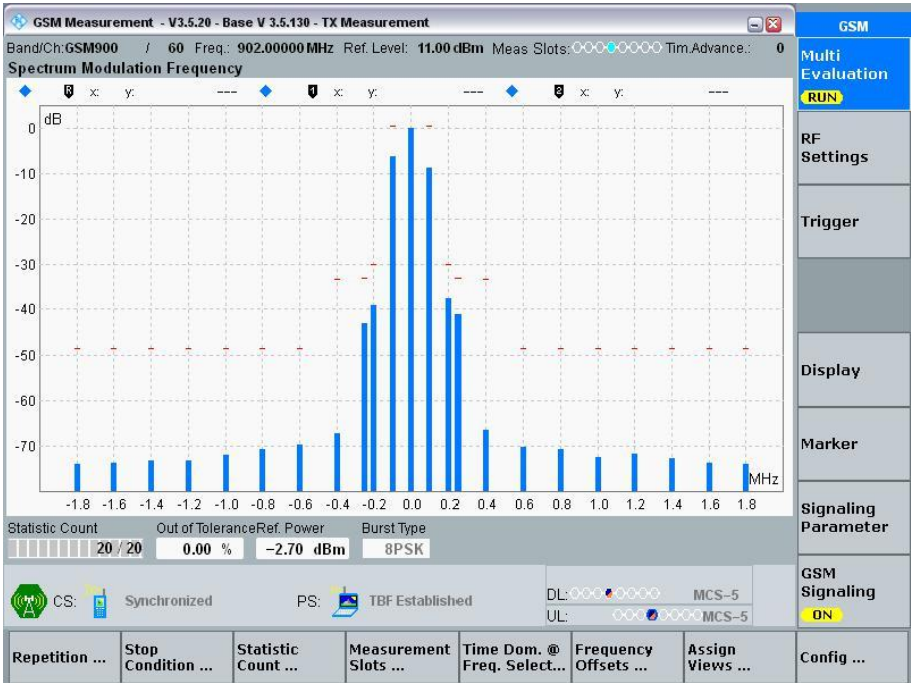




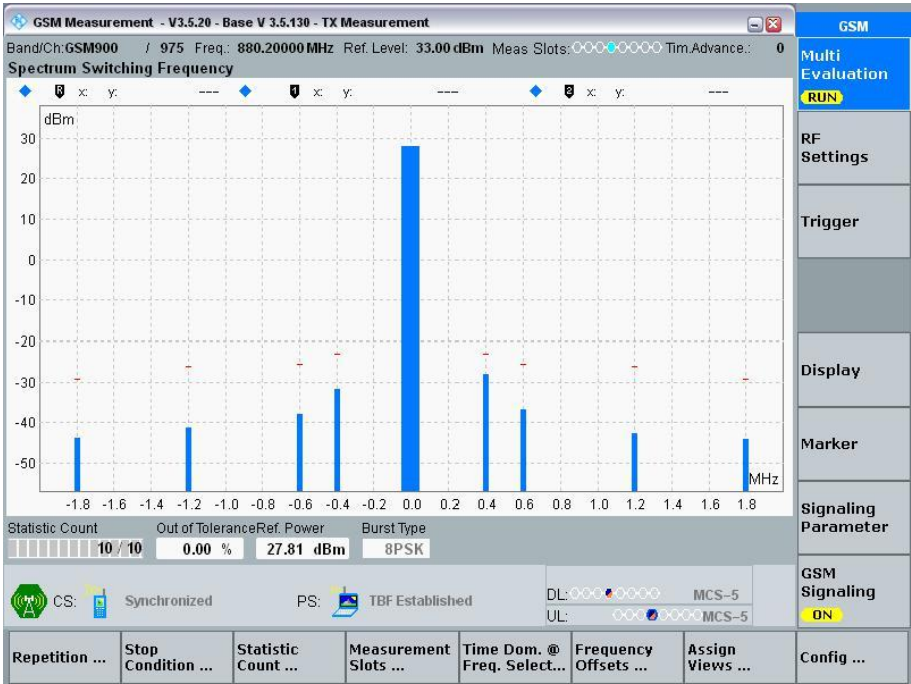
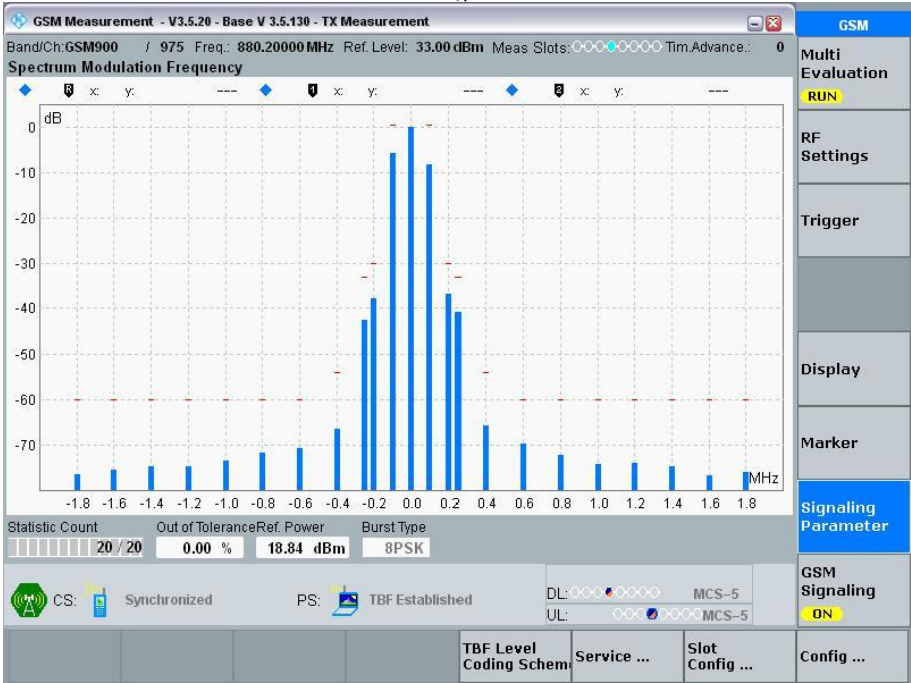
Normal Condition ( $\gamma=6$ ), Middle Channel



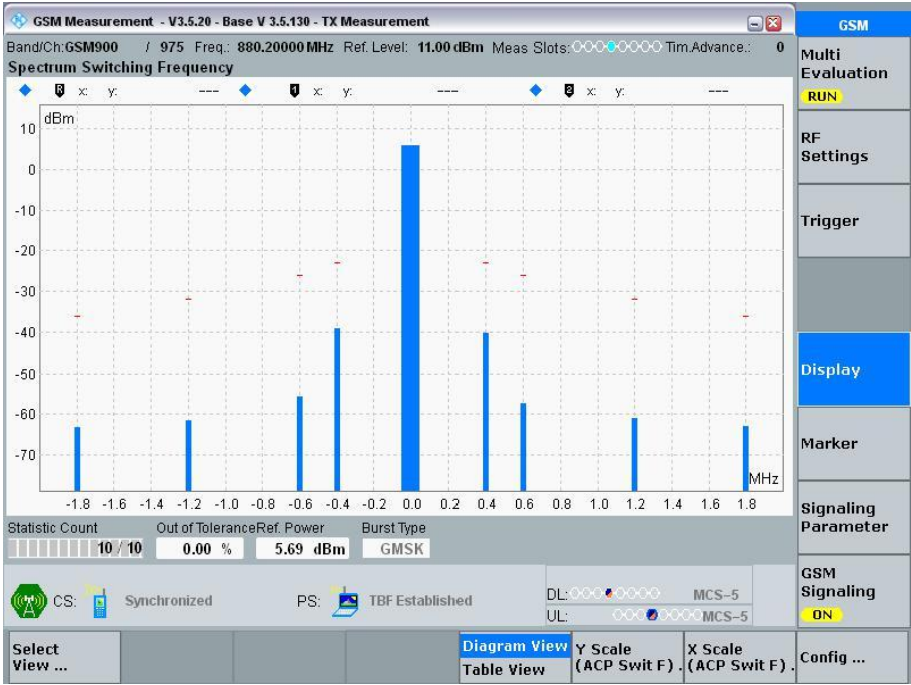
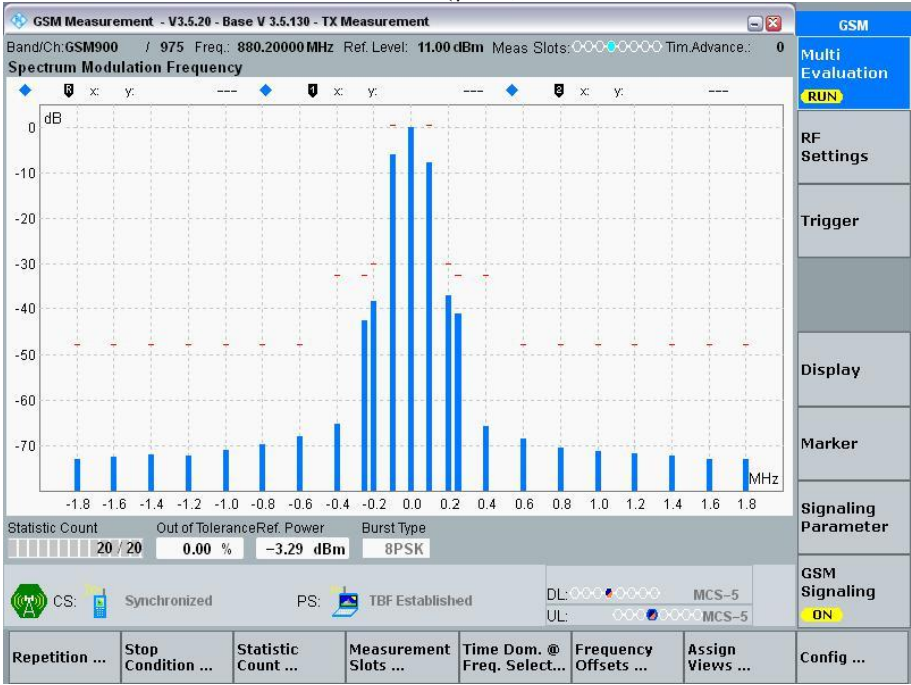
Normal Condition ( $\gamma=17$ ), Middle Channel



Normal Condition ( $\gamma=6$ ), Low Channel



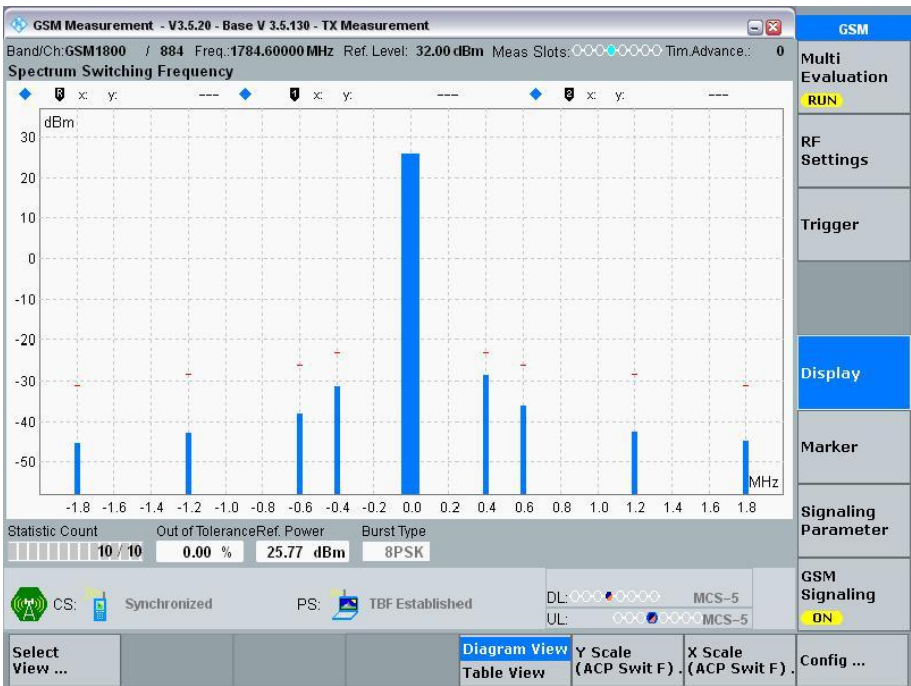
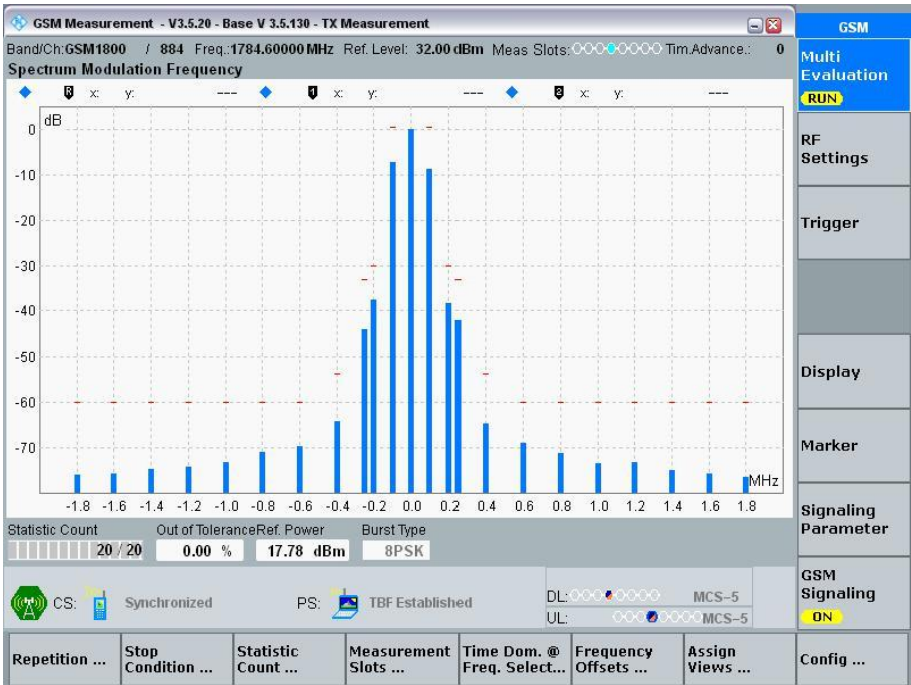
Normal Condition ( $\gamma=17$ ), Low Channel





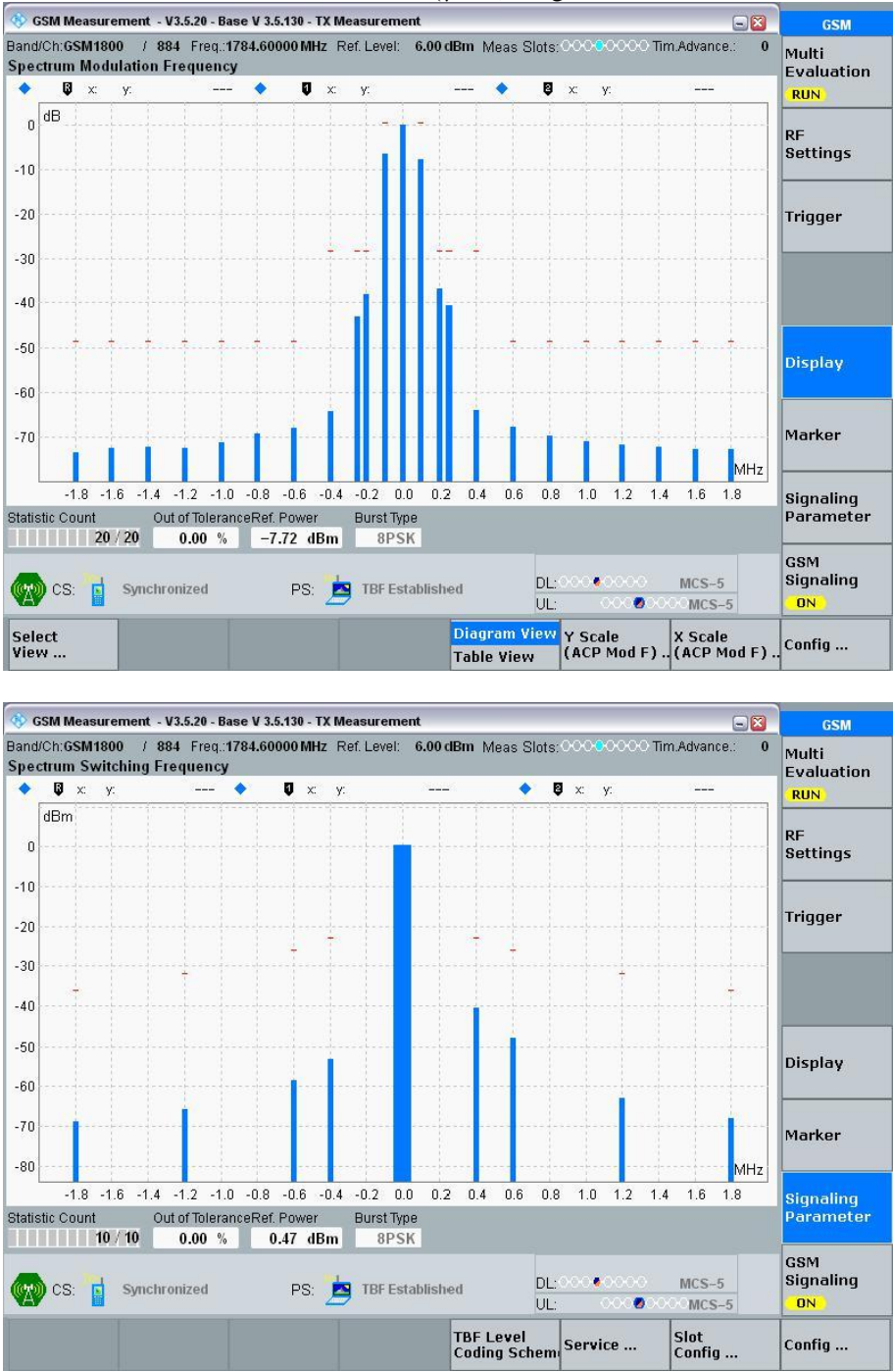
EGPRS 1800:

Normal Condition ( $\gamma=5$ ), High Channel

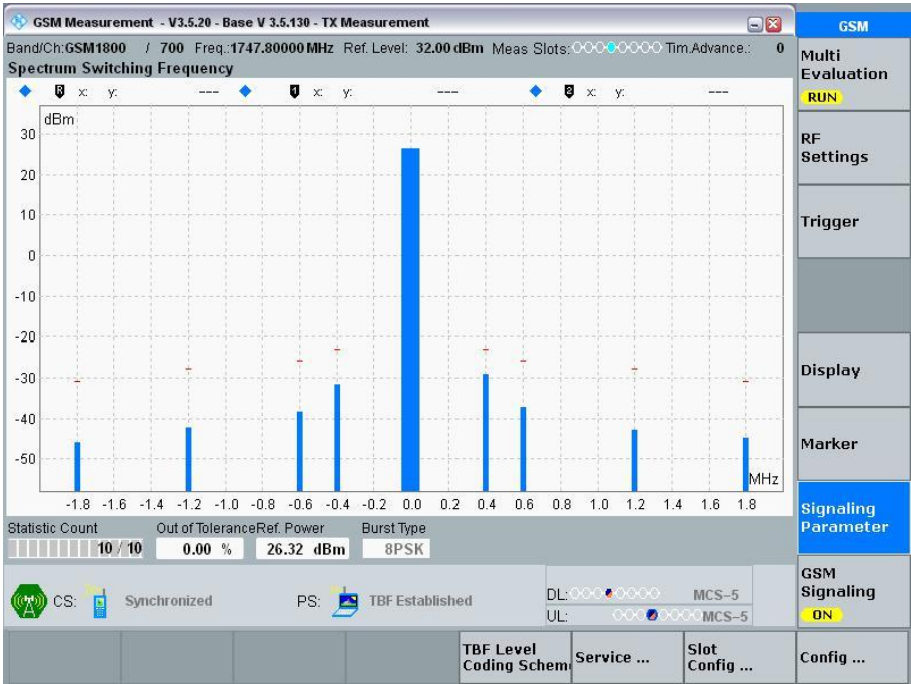
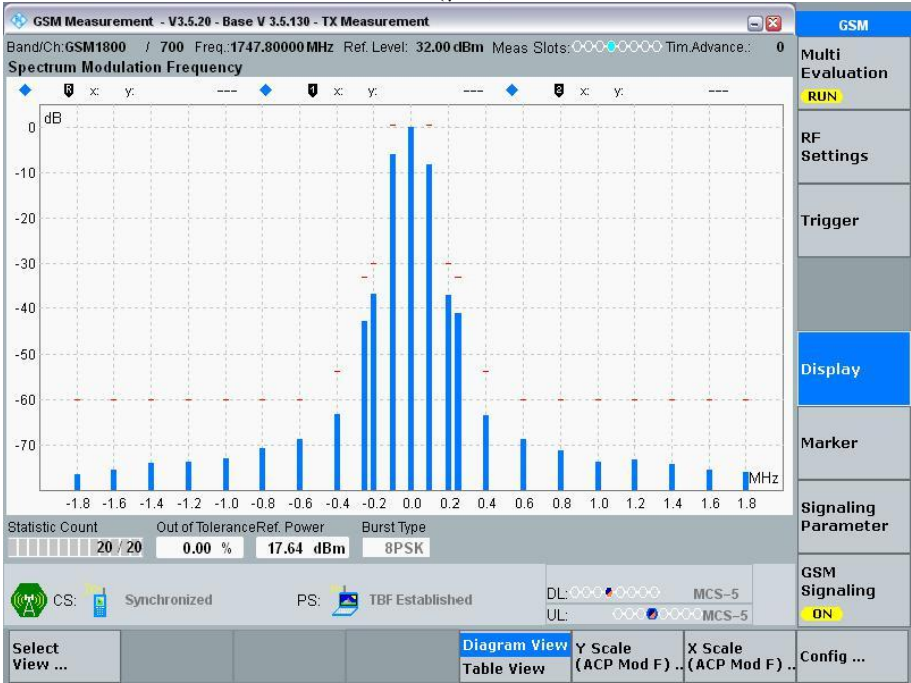




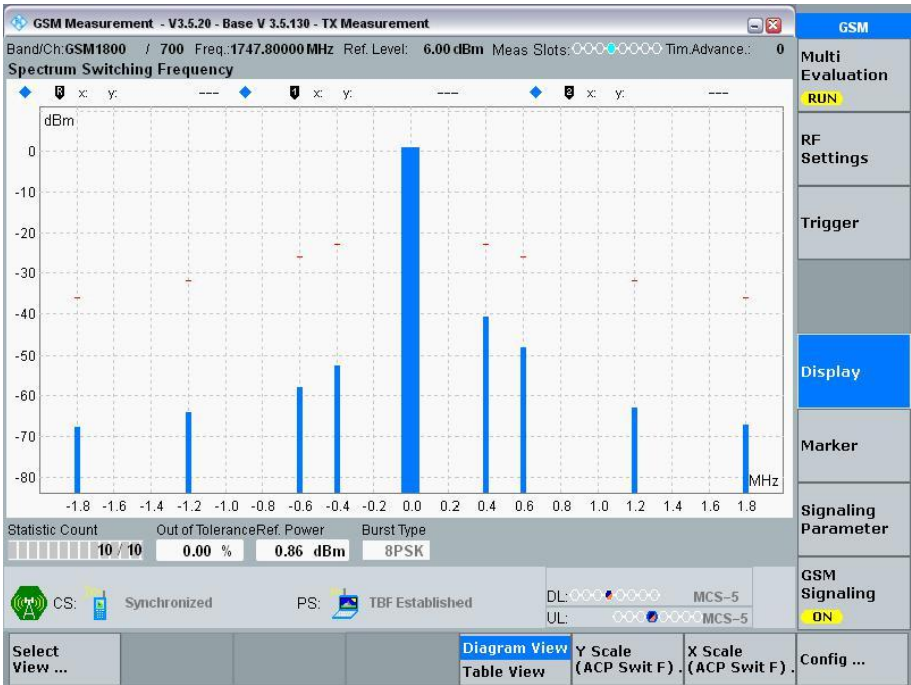
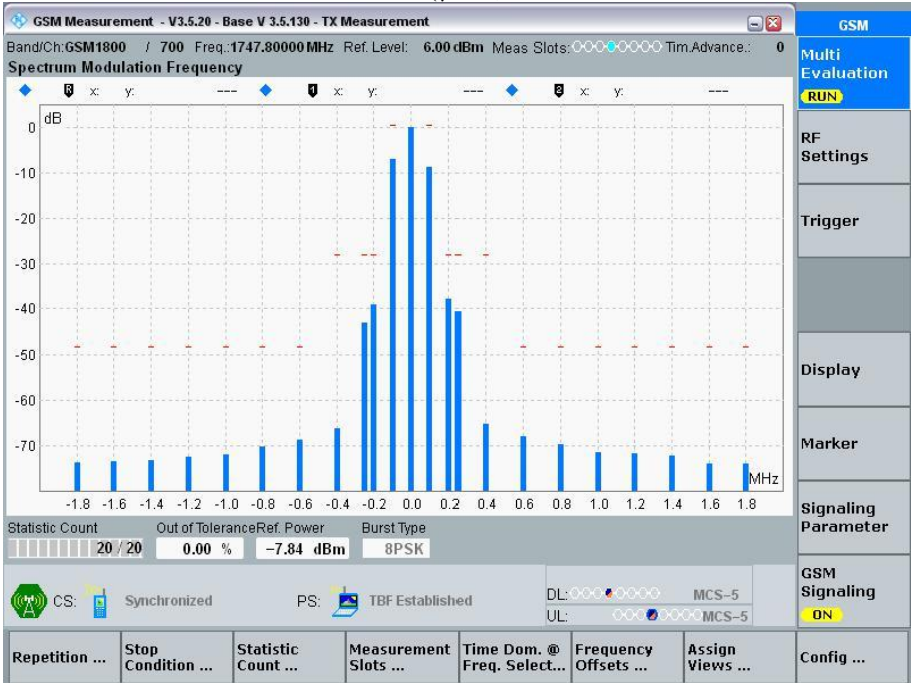
Normal Condition ( $\gamma=18$ ), High Channel



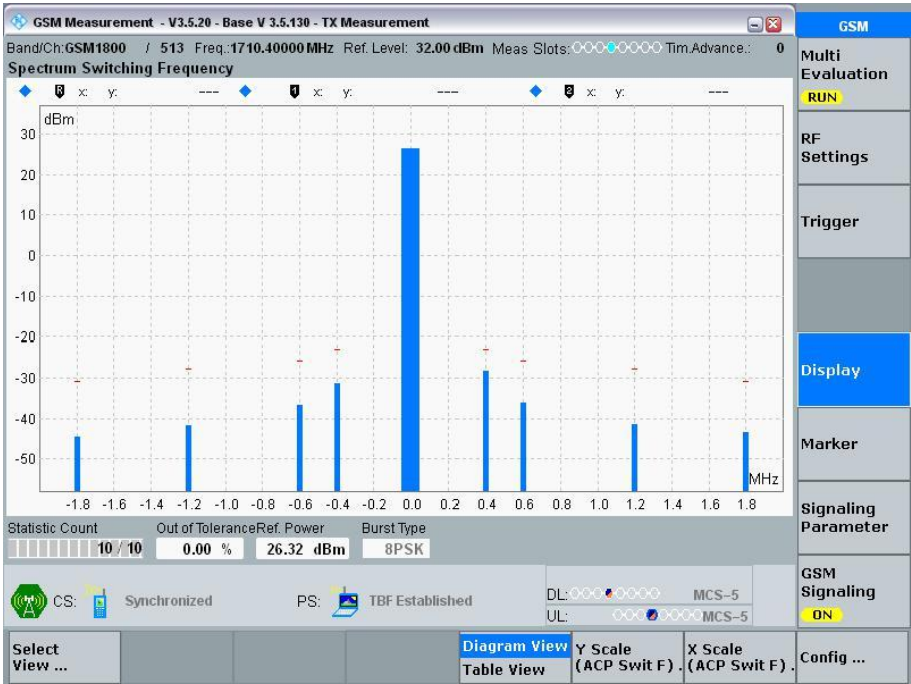
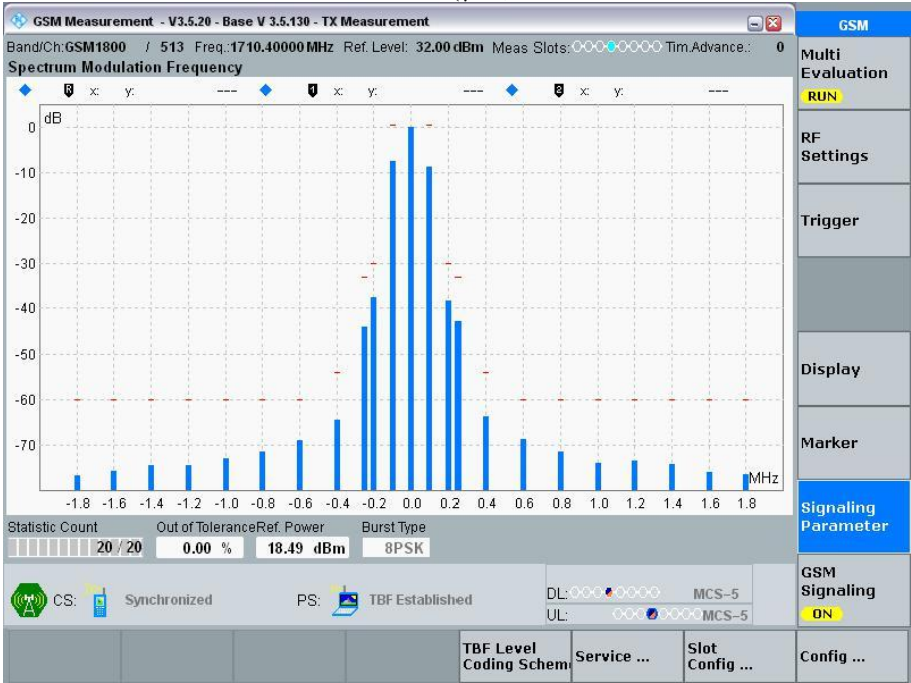
Normal Condition ( $\gamma=5$ ), Middle Channel



Normal Condition ( $\gamma=18$ ), Middle Channel

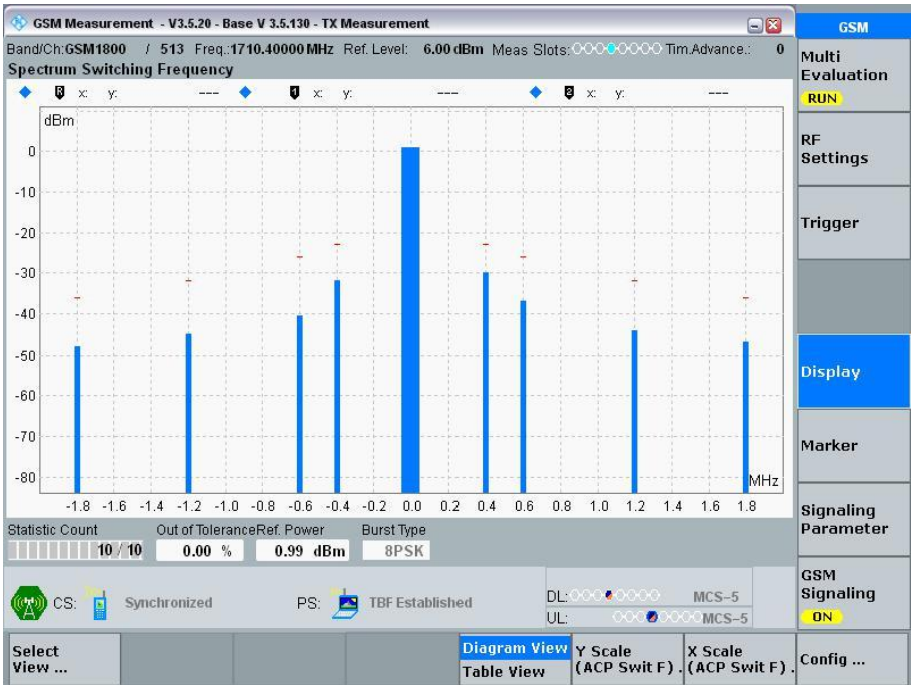
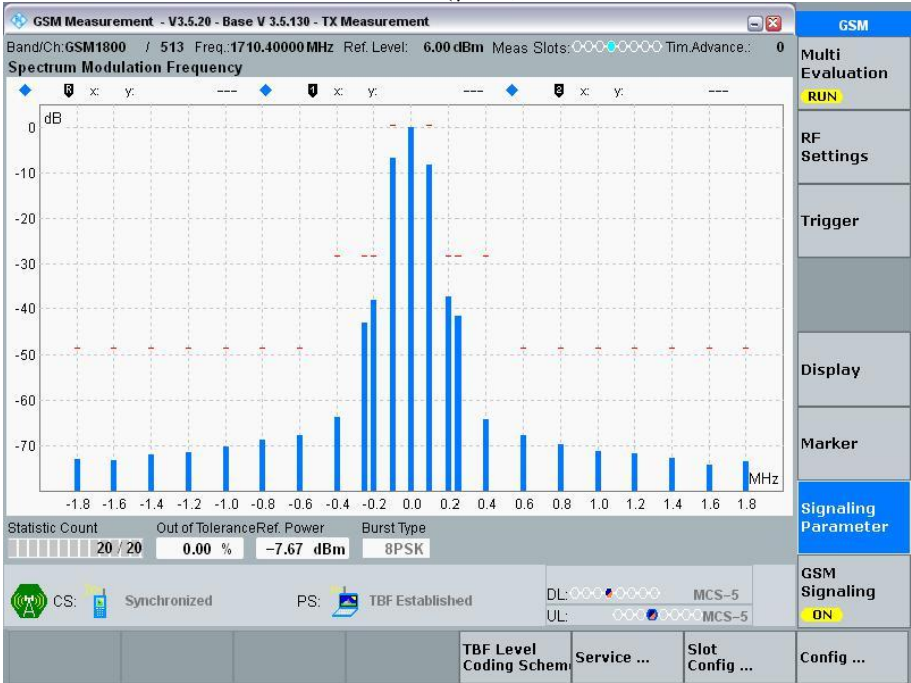


Normal Condition ( $\gamma=5$ ), Low Channel





Normal Condition ( $\gamma=18$ ), Low Channel





**Spurious Emissions in the MS receive bands:****For EGPRS 900 Band (Middle Channel)**

Frequency range (MHz)	Frequency (MHz)	Spurious Emissions		
		Level (dBm)	Limit (dBm)	Results
925-935	926.9	-73.92	-67	Pass
935-960	941.5	-84.84	-79	Pass
	953.0	-84.46	-79	Pass

**For EGPRS 1800 Band (Middle channel)**

Frequency range (MHz)	Frequency (MHz)	Spurious Emissions		
		Level (dBm)	Limit (dBm)	Results
1805-1880	1819.8	-76.73	-71	Pass
	1830.3	-77.58	-71	Pass
	1854.7	-74.27	-71	Pass
	1866.5	-77.58	-71	Pass

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

## §4.2.30 - BLOCKING AND SPURIOUS RESPONSE IN EGPRS CONFIGURATION

### Applicable Standard

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  $f_0$ , 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  $f_0$  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 dB  $\mu$ V(emf) (i.e. -43 dBm). 3GPP TS 05.05, sub clause 5.1.

### 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  $FR \pm 600$  kHz are excluded.

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

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

- i) The total frequency range formed by:

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

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		DCS 1 800
	Small MS	Other MS	
	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		GSM 480	
	Small MS	Other MS	Small MS	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 LEVEL IN dBμVemf( )	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 dBμVemf( ).

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 dBμVemf( ). 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 dBμVemf( ).

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.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

**Test Results: Pass****EGPRS 900 Band:**

<b>Channel frequency (MHz)</b>	<b>BLER (%)</b>	<b>Number of test samples</b>	<b>Limit (%)</b>	<b>Result</b>
Low	0.033	10000	10	pass
Middle	0.018	10000	10	pass
High	0.015	10000	10	pass

**EGPRS 1800 Band:**

<b>Channel frequency (MHz)</b>	<b>BLER (%)</b>	<b>Number of test samples</b>	<b>Limit (%)</b>	<b>Result</b>
Low	0.027	10000	10	pass
Middle	0.018	10000	10	pass
High	0.024	10000	10	pass



## §4.2.32 - INTERMODULATION REJECTION - SPEECH CHANNELS

### Applicable Standard

According to ETSI EN 301 511 V12.5.1 (2017-03), section 4.2.32,

The intermodulation rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

For E-GSM 900, R-GSM 900 and ER-GSM 900 MS this test is only performed in the P-GSM band.

In the presence of two unwanted signals with a specific frequency relationship to the wanted signal frequency the Class II RBER for TCH/FS shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 5.3.

The error rate measured in this test shall not exceed the test limit error rate values given in table 14-25. This shall apply under normal condition and under any combination of normal and extreme test voltages and ambient temperature, and with the two interfering signals at either side of the wanted frequency.

**Table 14-25: Limits for intermodulation rejection**

Channel	Propagation conditions	Type of measurement	Test limit error rate %	Minimum No. of samples
TCH/FS Class II	Static	RBER	2,439	8 200

### Test Procedure

A call is set up according to the generic call set up procedure on a TCH with an ARFCN in the Mid ARFCN range, power control level set to maximum power. The SS transmits Standard Test Signal C1 on the traffic channel.

- The amplitude of the wanted signal is set to 4 dB above the reference sensitivity level (see table 14-24).
- The SS commands the MS to create the loop back facility signalling erased frames.
- The SS produces a static wanted signal, and two static interfering (unwanted) signals at the same time. There is no correlation in the modulation between the signals.

The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above that of the receiver. This signal is static and unmodulated.

The second interfering signal is on an ARFCN eight above that of the receiver. This signal is static, continuous and modulated by random data.

The amplitude of both the interfering signals is set according to table 14-24.

- 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 of class II bits by examining at least the minimum number of samples of consecutive bits. Bits only taken from those frames which do not signal frame erasure. The number of error events is recorded.

- e) The measurement of step d) is repeated with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.
- f) Steps b) to e), are repeated but with the receiver operating on an ARFCN in the Low ARFCN range.
- g) Steps b) to e), are repeated but with the receiver operating on an ARFCN in the High ARFCN range.
- h) Steps a) to g) are repeated under extreme test conditions.

**Table 14-24: Intermodulation test signal levels**

	GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800		PCS 1 900
	Small MS	Other MS	Class 1 and 2	Class 3	
WANTED SIGNAL dBμVemf( )	15	13	17	15	15
FIRST INTERFERER dBμVemf( )	64	74	64	68	64
SECOND INTERFERER dBμVemf( )	63	63	64	68	64

NOTE: Some of the levels in table 14-24 are different to those specified in 3GPP TS 05.05 due to the consideration of the effect of modulation sideband noise from the second interferer.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition					Result
GSM 900	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
DCS 1800	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

Please refer to the following tables.

**GSM 900 Band:**

Test Channel	RBER (%)	Number of test samples	Limit (%)	Result
Low	0.008	10000	2.439	pass
Middle	0.006	10000	2.439	pass
High	0.001	10000	2.439	pass

**DCS 1800 Band:**

Test Channel	RBER (%)	Number of test samples	Limit (%)	Result
Low	0.002	10000	2.439	pass
Middle	0.003	10000	2.439	pass
High	0.002	10000	2.439	pass

Test Result: Compliance

## §4.2.34 - INTERMODULATION REJECTION – EGPRS

### Applicable Standard

According to ETSI EN 301 511 V12.5.1 (2017-03), section 4.2.34,

The intermodulation rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

For both GMSK and 8-PSK modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the Mid ARFCN range, power control level set to maximum. The power control parameter ALPHA ( $\alpha$ ) is set to 0.

The SS transmits EGPRS RLC data blocks containing random data. The amplitude of the wanted signal is set to 4 dB above the reference sensitivity level with appropriate correction value as specified in table 14.18-3a for GMSK modulation and table 14.18-3b for 8-PSK modulation for PDTCH channel and in tables 14.18-4a for GMSK modulation

and 14.18-4b for 8-PSK modulation for USF channel.

In addition to the static wanted test signal, the SS transmits two static interfering (unwanted) signals at the same time. There is no correlation in the modulation between the signals.

### Test procedure

For 8-PSK Modulation:

- a) The SS transmits packets on PDTCH using MCS-9 coding to the MS on all allocated timeslots.
- b) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.
- c) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).

The amplitude of both the interfering signals is set according to table 14.18-8.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 04.60, 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats steps d) and e) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

g) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the Low ARFCN.

h) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the High ARFCN range.

i) The SS repeats steps a) to f) for each of the coding schemes MCS-5,6,7 and 8 with the receiver operating on an ARFCN in the Middle ARFCN range.

- j) The SS repeats steps a) to h) under extreme test conditions for MCS-9 only.
- k) The SS establishes the normal test conditions. An uplink TBF shall be established.
- l) The SS sets the value of the USF/MCS-9 such as to allocate the uplink to the MS.
- m) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.
- n) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).  
The amplitude of both the interfering signals is set according to table 14.18-8.
- o) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.
- p) Once the number of USF/MCS-9 allocating the uplink for the MS as counted in step o) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.
- q) The SS repeats steps o) and p) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.
- r) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the Low ARFCN
- s) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the High ARFCN range.
- t) The SS repeats steps l) to s) under extreme test conditions for MCS-9 only

**Table 14.18-8: Intermodulation interfering test signal levels**

	GSM 400, GSM 700, T-GSM 810, GSM 850, GSM 900, PCS 1 900		DCS 1 800	
	Small MS	Other MS	Class 1 and 2	Class 3
FIRST INTERFERER dB $\mu$ Vemf( )	64	74	64	68
SECOND INTERFERER dB $\mu$ Vemf( )	63	63	64	68

NOTE: Some of the levels in table 14.18-8 are different to those specified in 3GPP TS 05.05 due to the consideration of the effect of modulation sideband noise from the second interferer.



**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

The testing was performed by Fan Yang on 2021-05-08.

Mode	Test Channel	Test Condition					Result
EGPRS 900	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
EGPRS 1800	Low	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
	High	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

Please refer to the following tables.

Mode	Test Frequency (MHz)	Type of Channel	BLER %	Number of test samples	Limit (%)
EGSM 900	880.2	PDTCH/MCS-9	1.95	4000	10.0
		USF/MCS-9	0.02	40000	1.0
	902	PDTCH/MCS-9	3.22	4000	10.0
		USF/MCS-9	0.31	40000	1.0
	914.8	PDTCH/MCS-9	0.65	4000	10.0
		USF/MCS-9	0.17	40000	1.0
DCS 1800	1710.4	PDTCH/MCS-9	4.00	4000	10.0
		USF/MCS-9	0.09	40000	1.0
	1747.8	PDTCH/MCS-9	1.28	4000	10.0
		USF/MCS-9	0.18	40000	1.0
	1784.6	PDTCH/MCS-9	0.79	4000	10.0
		USF/MCS-9	0.26	40000	1.0

Test Result: Compliance

## 4.2.35 - AM SUPPRESSION - SPEECH CHANNELS

### Applicable Standard

According to ETSI EN 301 511 V12.5.1 (2017-03), section 4.2.35,

AM suppression is a measure of the ability of the receiver to receive a modulated wanted input signal in the presence of an unwanted TDMA modulated interferer.

The reference sensitivity performance as specified in table 1 shall be met when the following signals are simultaneously input to the receiver:

- a useful signal at frequency  $f_0$ , 3 dB above the reference sensitivity level as specified in 3GPP TS 05.05 subclause 5.2.
- a single frequency ( $f$ ), in the relevant receive band,  $|f - f_0| > 6\text{MHz}$ , which is an integer multiple of 200 kHz, a GSM TDMA signal modulated by any 148-bits subsequence of the 511-bits pseudo random bit sequence, defined in ITU-T Recommendation O.153 fascicle IV.4, at a level as defined in the table below. The interferer shall have one timeslot active and the frequency shall be at least 2 channels separated from any identified spurious responses. The transmitted bursts shall be synchronized to but, delayed in time between 61 and 86 bit periods relative to the bursts of the wanted signal. 3GPP TS 05.05, subclause 5.2.

MS type	Signal level
GSM 400	-31 dBm
GSM 700	-31 dBm
GSM 850	-31 dBm
GSM 900	-31 dBm
DCS 1 800	-29 / -31 dBm (note)
PCS 1 900	-31 dBm
NOTE: The -31 dBm level shall apply to DCS 1 800 class 1 and class 2 MS meeting the -102 dBm reference sensitivity level requirement according to 3GPP TS 05.05, subclause 6.2.	

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

The error rates measured in this test shall not exceed the test limit error rate values given in table 14.27.

**Table 14-33: Limits for AM suppression**

Channel	Propagation conditions	Type of measurement	Test limit error rate %	Minimum No. of samples
TCH/FS Class II	Static	RBER	2,439	8 200

### Test Procedure

A call is set up according to the generic call set up procedure, on a TCH/FS with an ARFCN in the mid ARFCN range. The power control level is set to maximum power.

The SS transmits standard Test Signal C1 on the traffic channel (TCH frequency FR).

The SS commands the MS to create traffic channel loop back signalling erased frames.

This test is performed after test 14.7.

- a) The SS produces a static wanted signal with an amplitude 4 dB above reference sensitivity level.  
 b) The SS produces an interfering signal as described below:

- static fading profile;

- at an in band frequency greater than 6 MHz separated from FR and separated by at least two ARFCNs from any spurious responses.

NOTE: Spurious responses are identified by test cases 14.7.1 and 14.7.2.

- at a level as described in table 14-32.

- GSM TDMA modulated by random data with one timeslot active.

- synchronized to, but delayed between 61 and 86 bit periods to the bursts of the wanted signal.

**Table 14-32: Interferer signal level**

MS type	Signal level (dBμVemf)
GSM 400	82
GSM 700	82
T-GSM 810	82
GSM 850	82
GSM 900	82
DCS 1 800	82/84
PCS 1 900	82
NOTE: The 82 dBμVemf (i.e. -31 dBm) level shall apply to DCS 1 800 class 1 and class 2 MS meeting the -102 dBm reference sensitivity level requirement according to 3GPP TS 05.05, subclause 6.2.	

c) 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.

d) The SS tests the RBER compliance of class II bits by examining at least the minimum number of samples of consecutive bits. Bits only taken from those frames which do not signal frame erasure. The number of error events is recorded.

## Test Data

### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition					Result
GSM 900	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
DCS 1800	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

Please refer to the following tables:

**GSM 900 Band:**

Test Channel	RBBER (%)	Number of test samples	Limit (%)	Result
Middle	0.000	10000	2.439	pass

**DCS 1800 Band:**

Test Channel	RBBER (%)	Number of test samples	Limit (%)	Result
Middle	0.000	10000	2.439	pass

Test Result: Compliance

## **§4.2.38 - ADJACENT CHANNEL REJECTION - SPEECH CHANNELS (TCH/FS)**

### **Applicable Standard**

According to ETSI EN 301 511 V12.5.1 (2017-03), section 4.2.38,

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is implicitly tested in test 14.2.1

1. With adjacent channel interference at 200 kHz above and below the wanted signal and signal level 9 dB above the wanted signal level:

1.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the FER for TCH/FS shall be within the requirements of table 2 in 3GPP TS 05.05 subclause 6.3.

1.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class Ib RBER shall be within the requirements of table 2 in 3GPP TS 05.05 subclause 6.3.

1.3 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class II RBER shall be within the requirements of table 2 in 3GPP TS 05.05 subclause 6.3.

1.4 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class II RBER shall be within the requirements of table 2 in 3GPP TS 05.05 under extreme test conditions; 3GPP TS 05.05 subclause 6.3 and annex D subclauses D.2.1 and D.2.2.

2. For adjacent channel interference at 400 kHz above and below the wanted signal frequency and signal level 41dB above the wanted signal level:

2.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the FER for TCH/FS shall be within the requirements of table 2 in 3GPP TS 05.05 subclause 6.3.

2.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class Ib RBER shall be within the requirements of table 2 in 3GPP TS 05.05 subclause 6.3.

2.3 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class II RBER shall be within the requirements of table 2 in 3GPP TS 05.05 subclause 6.3.

2.4 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class II RBER shall be within the requirements of table 2 in 3GPP TS 05.05 under extreme test conditions; 3GPP TS 05.05 subclause 6.3 and annex D subclauses D.2.1 and D.2.2.



If a system simulator does not support the faded interferer, a static adjacent interferer has to be used. The following requirements apply.

2.5 For a TUhigh faded wanted signal and a static adjacent channel interferer, the FER for TCH/FS shall be better than:

GSM 400, GSM 700, GSM 850 and GSM 900:  $10,2 \cdot \alpha$  %; 3GPP TS 05.05, subclause 6.3;

DCS 1 800 and PCS 1 900:  $5,1 \cdot \alpha$  %; 3GPP TS 05.05, subclause 6.3.

2.6 For a TUhigh faded wanted signal and a static adjacent channel interferer, the Class Ib RBER shall be better than:

GSM 400, GSM 700, GSM 850 and GSM 900:  $0,72/\alpha$  %; 3GPP TS 05.05, subclause 6.3;

DCS 1 800 and PCS 1 900:  $0,45/\alpha$  %; 3GPP TS 05.05, subclause 6.3.

2.7 For a TUhigh faded wanted signal and a static adjacent channel interferer, the Class II RBER shall be better than:

GSM 400, GSM 700, GSM 850 and GSM 900: 8,8 %; 3GPP TS 05.05, subclause 6.3;

DCS 1 800 and PCS 1 900: 8,9 %; 3GPP TS 05.05, subclause 6.3.

2.8 For a TUhigh faded wanted signal and a static adjacent channel interferer, the Class II RBER shall be better than:

GSM 400, GSM 700, GSM 850 and GSM 900: 8,8 %;

DCS 1 800 and PCS 1 900: 8,9 %.

under extreme test conditions; 3GPP TS 05.05, subclause 6.3, annex D subclauses D.2.1 and D.2.2.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

**Table 14-22: Limits for adjacent channel selectivity**

Interference at	Channel	Type of measurement	GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
			Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
200 kHz	TCH/FS class Ib class II	FER	$6,742 \cdot \alpha$	8 900	$3,371 \cdot \alpha$	17 800
		RBER	$0,420/\alpha$	1 000 000	$0,270/\alpha$	2 000 000
		RBER	8,333	600 000	8,333	1 200 000
400 kHz Interferer TUhigh	TCH/FS class Ib class II	FER	$6,742 \cdot \alpha$	8 900	$3,371 \cdot \alpha$	17 800
		RBER	$0,420/\alpha$	1 000 000	$0,270/\alpha$	2 000 000
		RBER	8,333	600 000	8,333	1 200 000
400 kHz Interferer Static	TCH/FS class Ib class II	FER	$11,461 \cdot \alpha$	8 900	$5,714 \cdot \alpha$	10 500
		RBER	$0,756/\alpha$	1 000 000	$0,483/\alpha$	1 200 000
		RBER	9,167	600 000	9,167	720 000

The error rates measured in this test shall not exceed the test limit error rate given in table 14-22. This shall apply for any combination of normal and extreme test voltages and ambient temperature, and with the interfering signals at either side of the wanted frequency.

The parameter  $\alpha$  can range from 1 to 1,6. The value of  $\alpha$  for the RBER test on TCH/FS class Ib bits under particular measurement conditions shall be the same as that determined in the FER test on TCH/FS under the same conditions.

NOTE: A static unwanted signal may be used to avoid a potential problem with the implementation of the fading simulator.

## Test Procedure

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The SS commands the MS to create the traffic channel loop back signalling erased frames.

The SS transmits Standard Test Signal C1 on the TCH (wanted signal).

a) In addition to the wanted signal, the SS transmits an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

The fading characteristic of the wanted and the unwanted signal is set to TUhigh.

The unwanted signal is transmitted at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to 9dB above that of the wanted signal.

b) 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.

c) The SS tests the frame erasure compliance for the TCH/FS by examining at least the minimum number of samples of consecutive frames. The number of frame erasure events is recorded.

d) The SS determines the number of residual bit error events for the bits of the class Ib and class II, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib and class II, Bits are only taken from those frames for which no bad frame indication was given.

e) The measurement of steps c) and d) is repeated with the unwanted signal on a frequency at the same displacement from, but below, the frequency of the wanted signal.

f) The measurement of steps c) to e) shall be repeated for a displacement of the unwanted signal of 400 kHz, and with the amplitude of the unwanted signal 41 dB above the level of the wanted input signal, The fading characteristic of the wanted and the unwanted signal is set to TUhigh. If a system simulator does not support the faded interferer, a static adjacent interferer may be used

g) Steps c) to f) are repeated for class II BER under extreme test conditions.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition					Result
GSM 900	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
DCS 1800	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

Please refer to the following tables:

### GSM 900 Band:

Test channel	Interference at	Type of measurement	Test value (%)	Number of test samples	For Strictest Limit (%)	Result
Middle	200 kHz	FER (TCH/FS)	0	10000	6.742	pass
		RBER(class Ib)	0	1000000	0.420	pass
		RBER(class II)	0	600000	8.333	pass
	400 kHz Interferer TUhigh	FER (TCH/FS)	0	10000	6.742	pass
		RBER(class Ib)	0	1000000	0.420	pass
		RBER(class II)	0	600000	8.333	pass
	400 kHz Interferer Static	FER (TCH/FS)	0	10000	11.461	pass
		RBER(class Ib)	0	1000000	0.756	pass
		RBER(class II)	0	600000	9.167	pass

**DCS 1800 Band:**

Test channel	Interference at	Type of measurement	Test value (%)	Number of test samples	For Strictest Limit (%)	Result
Middle	200 kHz	FER (TCH/FS)	0	20000	3.371	pass
		RBER(class Ib)	0	2000000	0.270	pass
		RBER(class II)	0	1200000	8.333	pass
	400 kHz Interferer TUhigh	FER (TCH/FS)	0	20000	3.371	pass
		RBER(class Ib)	0	2000000	0.270	pass
		RBER(class II)	0	1200000	8.333	pass
	400 kHz Interferer Static	FER (TCH/FS)	0	11000	5.714	pass
		RBER(class Ib)	0	1200000	0.483	pass
		RBER(class II)	0	800000	9.167	pass

Test Result: Compliance

## §4.2.40 - ADJACENT CHANNEL REJECTION - EGPRS

### Applicable Standard

According to ETSI EN 301 511 V12.5.1 (2017-03), section 4.2.40,

The adjacent channel selectivity is a measure of the capability of the receiver to receive wanted data packets without exceeding a given degradation due to the presence of an interfering signal (I1) in the adjacent channel. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

The adjacent channel can be the adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is implicitly tested in test 14.18.2.

1. For GMSK modulation, under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio ( $C/I_{a1}$ ) exceeding  $C/I_c - 18\text{dB}$  where  $C/I_c$  is the co-channel interference ratio specified in table 14.18-5a for PDTCH and table 14.18-6a for USF channels.

1.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/MCS-1 to 4 shall not exceed 10 %; 3GPP TS 05.05, subclause 6.2.

1.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/MSC-1 to 4 shall not exceed 1 %; 3GPP TS 05.05, subclause 6.2.

For 8-PSK modulation, under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio ( $C/I_{a1}$ ) specified in table 14.18-7a.

1.3 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/MCS-5 to 9 shall not exceed 10 % or 30 % depending on Coding Scheme; 3GPP TS 05.05, subclause 6.2.

1.4 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/MSC-5 to 9 shall not exceed 1 %; 3GPP TS 05.05, subclause 6.2.



Table 14.18-7a: Adjacent channel interference ratio for MS  
at reference performance for 8-PSK modulation

GSM 400, GSM 700, GSM 850 and GSM 900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)
PDTCH/MCS-5	dB	2,5	-2	-1	-2
PDTCH/MCS-6	dB	5,5	0,5	2	1
PDTCH/MCS-7	dB	10,5	8	10	9
PDTCH/MCS-8	dB	15,5	9 (note 2)	11 (note 2)	10,5 (note 2)
PDTCH/MCS-9	dB	10 (note 2)	12,5 (note 2)	17 (note 2)	15,5 (note 2)
USF/MCS-5 to 9	dB	-1	-8,5	-8	-9,5
DCS 1 800 and PCS 1 900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)
PDTCH/MCS-5	dB	2,5	-2	-2	-1,5
PDTCH/MCS-6	dB	5,5	0,5	1,5	1,5
PDTCH/MCS-7	dB	10,5	8	12,5	12
PDTCH/MCS-8	dB	15,5	9 (note 2)	16 (note 2)	15,5 (note 2)
PDTCH/MCS-9	dB	10 (note 2)	12,5 (note 2)	(note 1)	(note 1)
USF/MCS-5 to 9	dB	-1	-8,5	-9	-9,5

NOTE 1: PDTCH for MCS-x can not meet the reference performance for some propagation conditions.  
NOTE 2: Performance is specified at 30% BLER for some cases.

3GPP TS 05.05, table 2g and subclause 6.3.

2 For both GMSK and 8-PSK modulations, under adjacent channel interference conditions with interfering signals at 400 kHz above and below the wanted signal frequency and at the adjacent interference ratio ( $C/I_{a2}$ ) exceeding  $C/I_c - 50\text{dB}$ .

2.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/MCS-1 to 4 shall not exceed 10 % for GMSK modulation; and for PDTCH/MCS-5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes; 3GPP TS 05.05, subclause 6.2.

2.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/MSC-1 to 9 shall not exceed 1 %; 3GPP TS 05.05, subclause 6.2.

$C/I_c$  is the co-channel interference ratio. For a PDTCH with GMSK modulation  $C/I_c$  is specified in table 14.18-5a; for a PDTCH with 8-PSK modulation  $C/I_c$  is specified in table 14.18-5b, for a USF with GMSK modulation  $C/I_c$  is specified in tables 14.18-6a; and for USF with 8-PSK modulation  $C/I_c$  is specified in table 14.18-6b. 3GPP TS 05.05, subclause 6.3.

3. The BLER shall not exceed the conformance requirements given in 1. and 2. under extreme conditions; 3GPP TS 05.05, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

## Test Procedure

For both GMSK and 8-PSK modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA ( $\alpha$ ) is set to 0. The SS transmits EGPRS RLC data blocks containing random data. In addition to the wanted test signal, the SS transmits an independent, uncorrelated interfering signal Standard Test Signal (I1). This unwanted signal is random, continuous and GMSK-modulated, and has no fixed relationship with the bit transitions of the wanted signal.

The fading characteristic of the wanted and the interfering signal is TUhigh/noFH

For GMSK Modulation:

- a) The SS transmits packets on PDTCH using MCS-1 coding to the MS on all allocated timeslots.
- b) The SS transmits the unwanted signal at a nominal frequency 200kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.
- c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 1: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

- d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.
- e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.
- f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.
- g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.
- h) The SS repeats steps b) to g) for each of the coding schemes MCS-2 to 4.
- i) The SS repeats steps a) to g) under extreme test conditions for MCS-4 coding scheme only.
- j) The SS establishes the normal test conditions. An uplink TBF shall be established.
- k) The SS sets the value of the USF/MCS-1 such as to allocate the uplink to the MS.
- l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.
- m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.
- n) Once the number of USF/MCS-1 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set at to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

r) The SS repeats steps k) to q) under extreme test conditions for coding scheme USF/MCS-4.

For 8-PSK Modulation:

a) The SS transmits packets on PDTCH using MCS-5 coding to the MS on all allocated timeslots.

b) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

h) The SS repeats steps b) to g) for each of the coding schemes MCS-6 to 8 and for the coding scheme MCS-9 with the TU low fading condition for both the wanted and the interfering signal.

i) The SS repeats steps a) to h) under extreme test conditions for coding scheme MCS-9 only.

j) The SS establishes the normal test conditions. An uplink TBF shall be established.

- k) The SS sets the value of the USF/MCS-5 such as to allocate the uplink to the MS.
- l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.
- m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.
- n) Once the number of USF/MCS-5 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.
- o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.
- p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.
- q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.
- r) The SS repeats steps k) to q) under extreme test conditions for coding scheme MCS-9.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition					Result
EGPRS 900	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
EGPRS1800	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

Please refer to the following tables:

#### EGPRS 900 Band:

Test channel	Propagation conditions	Type of measurement	Test value (%)	Number of test samples	For Strictest Limit (%)	Result
Middle	TUhigh	FER (TCH/FS)	0	10000	6.742	pass
		RBER(class Ib)	0	1000000	0.420	pass
		RBER(class II)	0	120000	8.333	pass
	RA	RBER(class II)	0	24000	7.5	pass
	HT	RBER(class II)	0	60000	9.333	pass
	Static	FER (TCH/FS)	0	200000	6.742	pass
		RBER(class Ib)	0	20000000	0.420	pass
		RBER(class II)	0	10000	8.333	pass



**EGPRS 1800 Band:**

Test channel	Propagation conditions	Type of measurement	Test value (%)	Number of test samples	For Strictest Limit (%)	Result
Middle	TUhigh	FER (TCH/FS)	0	15000	4.478	pass
		RBER(class Ib)	0	1500000	0.320	pass
		RBER(class II)	0	60000	8.333	pass
	RA	RBER(class II)	0	24000	7.5	pass
	HT	RBER(class II)	0	30000	9.333	pass
	Static	FER (TCH/FS)	0	200000	0.122	pass
		RBER(class Ib)	0	20000000	0.41	pass
		RBER(class II)	0	10000	2.439	pass

## §4.2.42 - REFERENCE SENSITIVITY - TCH/FS

### Applicable Standard

According to ETSI EN 301 511 V12.5.1 (2017-03), section 4.2.42,

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

For E-GSM 900 MS this test is only performed in the P-GSM band.

1. At reference sensitivity level, the TCH/FS FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

2 At reference sensitivity level, the TCH/FS class I RBER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

3 At reference sensitivity level, the TCH/FS class II RBER shall meet the reference sensitivity, performance of table 1 in 3GPP TS 05.05 subclause 6.2.

4. At reference sensitivity level, the TCH/FS class II RBER shall meet the reference sensitivity, performance of table 1 in GSM under extreme conditions; 3GPP TS 05.05 subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

The error rates measured for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the test limit error rate values given in table 14-5 or 14-6.

**Table 14-5: Limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 sensitivity**

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/FS								
FER	6,742* $\alpha$	8 900					0,122* $\alpha$	164 000
class Ib(RBER)	0,42/ $\alpha$	1 000 000					0,41/ $\alpha$	20 000 000
class II(RBER)	8,333	120 000	7,5	24 000	9,333	60 000	2,439	8 200

**Table 14-6: Limits for DCS 1 800 and PCS 1 900 sensitivity**

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/FS								
FER	4,478* $\alpha$	13 400					0,122* $\alpha$	164 000
class Ib(RBER)	0,32/ $\alpha$	1 500 000					0,41/ $\alpha$	20 000 000
class II(RBER)	8,333	60 000	7,5	24 000	9,333	30 000	2,439	8 200

Where  $\alpha$  is a parameter which can range from 1 to 1.6. The value of  $\alpha$  for a RBER test on TCH/FS class Ib bits under particular measurement conditions shall be the same as that determined in the FER test on

TCH/FS under the same conditions.

## Test Procedure

The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range  $15 \text{ dB}\mu\text{Vemf}()$  to  $35 \text{ dB}\mu\text{Vemf}()$ .

The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

When frequency hopping is used, the traffic channel may fall on any of the ARFCNs defined in clause 6.

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the Mid ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power.

NOTE: For GSM 900 ARFCN 70 is tested since this is the 73rd harmonic of the 13 MHz clock normally used internally in a MS.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

a) The fading function is set to TUhigh.

b) the SS sets the amplitude of the wanted signal to reference sensitivity level  $()$ .

c) 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.

d) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

g) Steps a) to d) are repeated under extreme test conditions.

h) Steps a) to g) are repeated for TCH/FS with ARFCNs in the Low ARFCN range for GSM 400, GSM 700, TGSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 5 for GSM 900 and the High ARFCN range.

NOTE: For GSM 900 ARFCN 5 is tested since this is the 72nd harmonic of the 13 MHz clock normally used internally in a MS.

i) Steps b) to d) are repeated with the SS fading function set in turn to RA and HT.

j) Steps b) to g) are repeated, with the SS fading function set to static and the MS is commanded by the SS into hopping mode using the hopping sequence defined in clause 6.

The amplitude of the wanted signal is set according to step b). All the other time slots, except the active ones, are set to 20 dB above reference sensitivity level( ). This implicitly tests adjacent time slot rejection.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition					Result
GSM 900	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
DCS 1800	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

Please refer to the following tables:

### GSM 900 Band:

Test channel	Propagation conditions	Type of measurement	Test value (%)	Number of test samples	For Strictest Limit (%)	Result
Middle	TUhigh	FER (TCH/FS)	0	10000	6.742	pass
		RBER(class Ib)	0	1000000	0.420	pass
		RBER(class II)	0	120000	8.333	pass
	RA	RBER(class II)	0	24000	7.5	pass
	HT	RBER(class II)	0	60000	9.333	pass
	Static	FER (TCH/FS)	0	200000	6.742	pass
		RBER(class Ib)	0	20000000	0.420	pass
		RBER(class II)	0	10000	8.333	pass

**DCS 1800 Band:**

Test channel	Propagation conditions	Type of measurement	Test value (%)	Number of test samples	For Strictest Limit (%)	Result
Middle	TUhigh	FER (TCH/FS)	0	15000	4.478	pass
		RBER(class Ib)	0	1500000	0.320	pass
		RBER(class II)	0	60000	8.333	pass
	RA	RBER(class II)	0	24000	7.5	pass
	HT	RBER(class II)	0	30000	9.333	pass
	Static	FER (TCH/FS)	0	200000	0.122	pass
		RBER(class Ib)	0	20000000	0.41	pass
		RBER(class II)	0	10000	2.439	pass

Test Result: Compliance

## §4.2.43- REFERENCE SENSITIVITY - FACCH/F

### Applicable Standard

According to ETSI EN 301 511 V12.5.1 (2017-03), section 4.2.43,

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

At reference sensitivity level, the FACCH/F FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

The error rates measured shall not exceed the test limit error rate values given in table 14-9.

Table 14-9: Limits for FACCH/F sensitivity

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Channels	Type of measurements	Propagation	Test limit error rate %	Minimum No of samples	Test limit error rate %	Minimum No of samples
FACCH/F	FER	TUhigh	8,961	6696	4,368	13736

### Test Procedure

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the Low ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel.

- The fading function is set to TUhigh.
- The SS sets the amplitude of the wanted signal to reference sensitivity level ( ).
- The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the low signal level the MS may not be able to acknowledge the Layer 2 frame with an RR frame and the SS will repeat the Layer 2 frame. Each repeated L2 frame will be counted and will indicate a frame erasure event.
- The SS determines the frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.



**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Please refer to the following tables:

**GSM 900 Band:**

Test channel	Propagation conditions	Type of measurement	Test value (%)	Number of test samples	Limit (%)	Result
Low	TUhigh	FER (FACCH/F)	0	7000	8.961	pass

**DCS 1800 Band:**

Test channel	Propagation conditions	Type of measurement	Test value (%)	Number of test samples	Limit (%)	Result
Low	TUhigh	FER (FACCH/F)	0	14000	4.368	pass

Test Result: Compliance

## §4.2.44- MINIMUM INPUT LEVEL FOR REFERENCE PERFORMANCE - GPRS

### Applicable Standard

According to ETSI EN 301 511 V12.5.1 (2017-03), section 4.2.44,

The minimum input level is the signal level at the MS receiver input at which a certain BLER is met.

1. The block error rate (BLER) performance shall not exceed 10 % at input levels according to the table below.

Type of channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
<b>GSM 400, GSM 700, GSM 850 and GSM 900</b>						
PDTCH/CS-1	dBm	-104	-104	-104	-104	-103
PDTCH/CS-2	dBm	-104	-100	-101	-101	-99
PDTCH/CS-3	dBm	-104	-98	-99	-98	-96
PDTCH/CS-4	dBm	-101	-90	-90	*	*
<b>DCS 1 800 and PCS 1 900</b>						
PDTCH/CS-1	dBm	-104	-104	-104	-104	-103
PDTCH/CS-2	dBm	-104	-100	-100	-101	-99
PDTCH/CS-3	dBm	-104	-98	-98	-98	-94
PDTCH/CS-4	dBm	-101	-88	-88	*	*

The input levels given in the above Table are referenced to normal GSM 900 MS, and have to be corrected by the following values for other MS:

GSM 400, GSM 700, GSM 850 and GSM 900 small MS	+2 dB
DCS 1800 class 1 or 2 MS	+2/+4 dB**
DCS 1800 class 3 and PCS 1 900 class 1 or 2 MS	+2 dB
PCS 1 900 class 3 MS	0 dB

\*\* For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 05.05, table 1a; 3GPP TS 05.05, subclause 6.2.

2. The block error rate (BLER) performance shall not exceed 1 % at input levels according to the table below.

Type of channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
<b>GSM 400, GSM 700, GSM 850 and GSM 900</b>						
USF/CS-1	dBm	< -104	-101	-103	-103	-101
USF/CS-2 to 4	dBm	< -104	-103	-104	-104	-104
<b>DCS 1 800 and PCS 1 900</b>						
USF/CS-1	dBm	< -104	-103	-103	-103	-101
USF/CS-2 to 4	dBm	< -104	-104	-104	-104	-103

The input levels given in the above Table are referenced to normal GSM 900 MS, and have to be corrected by the following values for other MS:

GSM 400, GSM 700, GSM 850 and GSM 900 small MS	+2 dB
DCS 1800 class 1 or 2 MS	+2/+4 dB**
DCS 1800 class 3 and PCS 1 900 class 1 or 2 MS	+2 dB
PCS 1 900 class 3 MS	0 dB

\*\* For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 05.05, table 1a; 3GPP TS 05.05, subclause 6.2.

3. The BLER shall not exceed the conformance requirements given in 1. - 2. under extreme conditions; 3GPP TS 05.05, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

4. The reference sensitivity performance specified above need not be met in the following cases:

for MS at the static channel, if the received level on either of the two adjacent timeslots to the wanted exceed the wanted timeslot by more than 20 dB;

for MS on a multislot configuration, if the received level on any of the timeslots belonging to the same multislot configuration as the wanted time slot, exceed the wanted time slot by more than 6 dB;

The interfering adjacent time slots shall be static with valid GSM signals in all cases;

3GPP TS 05.05, subclause 6.2.

5. For an MS allocated a USF on a PDCH with a random RF input or a valid PDCH signal with a random USF not equal to the allocated USF, the overall reception shall be such that the MS shall detect the allocated USF in less than 1% of the radio blocks. This requirement shall be met for all input levels up to -40 dBm.

3GPP TS 05.05, subclause 6.4

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

## Test Procedure

a) The SS transmits packets under Static propagation conditions, using CS-3 coding at a level of 1 dB above the level given in conformance reference 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using CS-3 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with CS-3 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with CS-3 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14.16-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following four fading conditions and hopping modes: TUhigh/noFH, TUhigh/FH, HT/noFH and RA/noFH. For these tests with fading channels, the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using CS-4 coding with the following three fading conditions: Static/FH, TUhigh/noFH and TUhigh/FH. For these tests with fading channels, the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to f) under extreme test conditions.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

- P0 = 14 dBm;
- BTS\_PWR\_CTRL\_MODE = Mode A;
- PR\_MODE = B.

Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH.

j) The SS sets the value of the USF/CS-1 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/CS-1 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14.16-2, the SS calculates the Block error ratio. The SS resets both counters.

m) The SS repeats steps j) to l) using USF/CS2 to 4 coding.

NOTE: Since coding for USF-bits is identical for CS2 and CS3, it's not required to perform the step for both of those CS.

n) The SS repeats steps i) to m) under extreme test conditions.

o) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/CS-1 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition					Result
GSM 900	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
DCS 1800	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

Please refer to the following tables:

**GSM 900 Band:**

Propagation conditions	Type of channel	BLER Test value (%)	Limit (%)	Result
Static	PDTCH/CS-1	0	10	pass
	PDTCH/CS-2	0	10	pass
	PDTCH/CS-3	0	10	pass
	PDTCH/CS-4	0	10	pass
	USF/CS-1	0	1	pass
	USF/CS-2 to 4	0	1	pass
TUhigh (no FH)	PDTCH/CS-1	0	10	pass
	PDTCH/CS-2	0	10	pass
	PDTCH/CS-3	0	10	pass
	PDTCH/CS-4	0	10	pass
	USF/CS-1	0	1	pass
	USF/CS-2 to 4	0	1	pass
TUhigh (ideal FH)	PDTCH/CS-1	0	10	pass
	PDTCH/CS-2	0	10	pass
	PDTCH/CS-3	0	10	pass
	PDTCH/CS-4	0	10	pass
	USF/CS-1	0	1	pass
	USF/CS-2 to 4	0	1	pass
RA (no FH)	PDTCH/CS-1	0	10	pass
	PDTCH/CS-2	0	10	pass
	PDTCH/CS-3	0	10	pass
	PDTCH/CS-4	0	10	pass
	USF/CS-1	0	1	pass
	USF/CS-2 to 4	0	1	pass
HT (no FH)	PDTCH/CS-1	0	10	pass
	PDTCH/CS-2	0	10	pass
	PDTCH/CS-3	0	10	pass
	PDTCH/CS-4	0	10	pass
	USF/CS-1	0	1	pass
	USF/CS-2 to 4	0	1	pass



**DCS 1800 Band:**

Propagation conditions	Type of channel	BLER Test value (%)	Limit (%)	Result
Static	PDTCH/CS-1	0	10	pass
	PDTCH/CS-2	0	10	pass
	PDTCH/CS-3	0	10	pass
	PDTCH/CS-4	0	10	pass
	USF/CS-1	0	1	pass
	USF/CS-2 to 4	0	1	pass
TUhigh (no FH)	PDTCH/CS-1	0	10	pass
	PDTCH/CS-2	0	10	pass
	PDTCH/CS-3	0	10	pass
	PDTCH/CS-4	0	10	pass
	USF/CS-1	0	1	pass
	USF/CS-2 to 4	0	1	pass
TUhigh (ideal FH)	PDTCH/CS-1	0	10	pass
	PDTCH/CS-2	0	10	pass
	PDTCH/CS-3	0	10	pass
	PDTCH/CS-4	0	10	pass
	USF/CS-1	0	1	pass
	USF/CS-2 to 4	0	1	pass
RA (no FH)	PDTCH/CS-1	0	10	pass
	PDTCH/CS-2	0	10	pass
	PDTCH/CS-3	0	10	pass
	PDTCH/CS-4	0	10	pass
	USF/CS-1	0	1	pass
	USF/CS-2 to 4	0	1	pass
HT (no FH)	PDTCH/CS-1	0	10	pass
	PDTCH/CS-2	0	10	pass
	PDTCH/CS-3	0	10	pass
	PDTCH/CS-4	0	10	pass
	USF/CS-1	0	1	pass
	USF/CS-2 to 4	0	1	pass

## §4.2.45- MINIMUM INPUT LEVEL FOR REFERENCE PERFORMANCE – EGPRS

### Applicable Standard

According to ETSI EN 301 511 V12.5.1 (2017-03), section 4.2.44,

The minimum input level is the signal level at the MS receiver input at which a certain BLER is met.

1. The block error rate (BLER) performance for PDTCH/MCS1 to 4 shall not exceed 10 % at input levels according to the table 14.18-3a; and for PDTCH/MCS5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes at input levels according to the table 14.18-3b.

**Table 14.18-3a: PDTCH Sensitivity Input Level for GMSK modulation**

Type of Channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
<b>GSM 400, GSM 700, GSM 850 and GSM 900</b>						
PDTCH/MCS-1	dBm	-104	-102,5	-103	-103	-102
PDTCH/MCS-2	dBm	-104	-100,5	-101	-100,5	-100
PDTCH/MCS-3	dBm	-104	-96,5	-96,5	-92,5	-95,5
PDTCH/MCS-4	dBm	-101,5	-91	-91	(note)	(note)
<b>DCS 1 800 and PCS 1 900</b>						
PDTCH/MCS-1	dBm	-104	-102,5	-103	-103	-101,5
PDTCH/MCS-2	dBm	-104	-100,5	-101	-100,5	-99,5
PDTCH/MCS-3	dBm	-104	-96,5	-96,5	-92,5	-94,5
PDTCH/MCS-4	dBm	-101,5	-90,5	-90,5	(note)	(note)

NOTE: PDTCH/MCS-4 can not meet the reference performance for some propagation conditions.

The input levels given in the above Table are applicable to GSM 400, GSM 700, GSM 850, GSM 900 and PCS 1 900 MS, and have to be corrected by the following values for the following classes of MS:

GSM 400 small MS +2 dB;

GSM 700, GSM 850, GSM 900 small MS +2 dB;

DCS 1800 class 1 or 2 MS +2/+4 dB\*\*;

DCS 1800 class 3 MS +2 dB;

PCS 1 900 class 1 or 2 MS +2 dB.

\*\* For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 05.05, table 1a; 3GPP TS 05.05, subclause 6.2

**Table 14.18-3b: PDTCH Sensitivity Input Level for MS for 8-PSK modulation**

GSM 400, GSM 700, GSM 850 and GSM 900						
Type of channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
PDTCH/MCS-5	dBm	-98	-93	-94	-93	-92
PDTCH/MCS-6	dBm	-96	-91	-91,5	-88	-89
PDTCH/MCS-7	dBm	-93	-84	-84	(note 2)	-83 (note 3)
PDTCH/MCS-8	dBm	-90,5	-83 (note 3)	-83 (note 3)	(note 2)	(note 2)
PDTCH/MCS-9	dBm	-86	-78,5 (note 3)	-78,5 (note 3)	(note 2)	(note 2)
DCS 1 800 and PCS 1 900						
Type of channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
PDTCH/MCS-5	dBm	-98	-93,5	-93,5	-93	-89,5
PDTCH/MCS-6	dBm	-96	-91	-91	-88	-83,5
PDTCH/MCS-7	dBm	-93	-81,5	-80,5	(note 2)	(note 2)
PDTCH/MCS-8	dBm	-90,5	-80 (note 3)	-80 (note 3)	(note 2)	(note 2)
PDTCH/MCS-9	dBm	-86	(note 2)	(note 2)	(note 2)	(note 2)
NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TUhigh (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz.						
NOTE 2: PDTCH for MCS-x can not meet the reference performance for some propagation conditions.						
NOTE 3: Performance is specified at 30% BLER for some cases.						

The input levels given in the above Table are applicable to Class 4 or Class 5 MS for GSM 400, GSM 700, GSM 850 and GSM 900 and to Class 1 or Class 2 MS for DCS 1 800 and PCS 1 900. For all other MS the input levels have to be corrected by the value of -2 dB.

3GPP TS 05.05, tables 1c; 3GPP TS 05.05, subclause 6.2

2. The block error rate (BLER) performance for USF/MCS1 to 9 shall not exceed 1 % at input levels according to the tables 14.18-4a and 14.18-4b.

**Table 14.18-4a: USF Sensitivity Input Level for GMSK modulation**

Type of channel	Propagation conditions				
	static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900					
USF/MCS-1 to 4	dBm	-104	-102,5	-104	-102,5
DCS 1 800 and PCS 1 900					
USF/MCS-1 to 4	dBm	-104	-104	-104	-102,5

The input levels given in the above Table are applicable to GSM 400, GSM 700, GSM 850, GSM 900 and PCS 1 900 MS, and have to be corrected by the following values for the following classes of MS:

GSM 400 small MS +2 dB;

GSM 700, GSM 850 and GSM 900 small MS +2 dB;

DCS 1800 class 1 or 2 MS +2/+4 dB\*\*;

DCS 1800 class 3 MS +2 dB;

PCS 1 900 class 1 or 2 MS +2 dB.

\*\* For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

**Table 14.18-4b: USF Sensitivity Input Level for 8-PSK modulation**

Type of Channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
USF/MCS-5 to 9	dBm	-102	-97,5	-99	-100	-99
DCS 1 800 and PCS 1 900						
USF/MCS-5 to 9	dBm	-102	-99	-99	-100	-99

The input levels given in the above Table are applicable to Class 4 or Class 5 MS for GSM 400, GSM 700, GSM 850 and GSM 900 and to Class 1 or Class 2 MS for DCS 1 800 and PCS 1 900. For all other MS the input levels have to be corrected by the value of -2 dB.

3GPP TS 05.05, table 1c; 3GPP TS 05.05, subclause 6.2

3. The BLER shall not exceed the conformance requirements given in 1. and 2. under extreme conditions;

3GPP TS 05.05, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

4. The reference sensitivity performance specified above need not be met in the following cases:

For MS at the static channel, if the received level on either of the two adjacent timeslots to the wanted exceed the wanted timeslot by more than 20 dB.

For MS on a multislot configuration, if the received level on any of the timeslots belonging to the same multislot configuration as the wanted time slot, exceed the wanted time slot by more than 6 dB.

The interfering adjacent time slots shall be static with valid GSM signals in all cases.

3GPP TS 05.05, subclause 6.2.

5. For an MS allocated a USF on a PDCH with a random RF input or a valid PDCH signal with a random USF not equal to the allocated USF, the overall reception shall be such that the MS shall detect the allocated USF in less than 1 % of the radio blocks for GMSK modulated signals and 1 % for 8-PSK modulated signals. This requirement shall be met for all input levels up to -40 dBm for GMSK modulated signals and up to -40 dBm for 8-PSK modulated signals

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Fan Yang on 2021-05-08.*

Mode	Test Channel	Test Condition					Result
EGPRS 900	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance
EGPRS 1800	Middle	Normal	L.V. L.T.	L.V. H.T.	H.V L.T	H.V. H.T	Compliance

Please refer to the following tables:

**EGPRS 900 Band:**

Propagation conditions	Type of channel	BLER Test value (%)	Limit (%)	Result
Static	PDTCH/MCS-1	0	10	pass
	PDTCH/MCS-2	0	10	pass
	PDTCH/MCS-3	0	10	pass
	PDTCH/MCS-4	0	10	pass
	PDTCH/MCS-5	0	10	pass
	PDTCH/MCS-6	0	10	pass
	PDTCH/MCS-7	0	10	pass
	PDTCH/MCS-8	0	10	pass
	PDTCH/MCS-9	0	10	pass
	USF/MCS-1 to 4	0	1	pass
	USF/MCS-5 to 9	0	1	pass
TUhigh (no FH)	PDTCH/MCS-1	0	10	pass
	PDTCH/MCS-2	0	10	pass
	PDTCH/MCS-3	0	10	pass
	PDTCH/MCS-4	0	10	pass
	PDTCH/MCS-5	0	10	pass
	PDTCH/MCS-6	0	10	pass
	PDTCH/MCS-7	0	10	pass
	PDTCH/MCS-8	0	10	pass
	PDTCH/MCS-9	0	10	pass
	USF/MCS-1 to 4	0	1	pass
	USF/MCS-5 to 9	0	1	pass

Propagation conditions	Type of channel	BLER Test value (%)	Limit (%)	Result
TUhigh (ideal FH)	PDTCH/MCS-1	0	10	pass
	PDTCH/MCS-2	0	10	pass
	PDTCH/MCS-3	0	10	pass
	PDTCH/MCS-4	0	10	pass
	PDTCH/MCS-5	0	10	pass
	PDTCH/MCS-6	0	10	pass
	PDTCH/MCS-7	0	10	pass
	PDTCH/MCS-8	0	10	pass
	PDTCH/MCS-9	0	10	pass
	USF/MCS-1 to 4	0	1	pass
	USF/MCS-5 to 9	0	1	pass
RA (no FH)	PDTCH/MCS-1	0	10	pass
	PDTCH/MCS-2	0	10	pass
	PDTCH/MCS-3	0	10	pass
	PDTCH/MCS-4	0	10	pass
	PDTCH/MCS-5	0	10	pass
	PDTCH/MCS-6	0	10	pass
	PDTCH/MCS-7	0	10	pass
	PDTCH/MCS-8	0	10	pass
	PDTCH/MCS-9	0	10	pass
	USF/MCS-1 to 4	0	1	pass
	USF/MCS-5 to 9	0	1	pass



Propagation conditions	Type of channel	BLER Test value (%)	Limit (%)	Result
HT (no FH)	PDTCH/MCS-1	0	10	pass
	PDTCH/MCS-2	0	10	pass
	PDTCH/MCS-3	0	10	pass
	PDTCH/MCS-4	0	10	pass
	PDTCH/MCS-5	0	10	pass
	PDTCH/MCS-6	0	10	pass
	PDTCH/MCS-7	0	10	pass
	PDTCH/MCS-8	0	10	pass
	PDTCH/MCS-9	0	10	pass
	USF/MCS-1 to 4	0	1	pass
	USF/MCS-5 to 9	0	1	pass

**EGPRS 1800 Band:**

Propagation conditions	Type of channel	BLER Test value (%)	Limit (%)	Result
Static	PDTCH/MCS-1	0	10	pass
	PDTCH/MCS-2	0	10	pass
	PDTCH/MCS-3	0	10	pass
	PDTCH/MCS-4	0	10	pass
	PDTCH/MCS-5	0	10	pass
	PDTCH/MCS-6	0	10	pass
	PDTCH/MCS-7	0	10	pass
	PDTCH/MCS-8	0	10	pass
	PDTCH/MCS-9	0	10	pass
	USF/MCS-1 to 4	0	1	pass
	USF/MCS-5 to 9	0	1	pass
TUhigh (no FH)	PDTCH/MCS-1	0	10	pass
	PDTCH/MCS-2	0	10	pass
	PDTCH/MCS-3	0	10	pass
	PDTCH/MCS-4	0	10	pass
	PDTCH/MCS-5	0	10	pass
	PDTCH/MCS-6	0	10	pass
	PDTCH/MCS-7	0	10	pass
	PDTCH/MCS-8	0	10	pass
	PDTCH/MCS-9	0	10	pass
	USF/MCS-1 to 4	0	1	pass
	USF/MCS-5 to 9	0	1	pass

Propagation conditions	Type of channel	BLER Test value (%)	Limit (%)	Result
TU <sup>high</sup> (ideal FH)	PDTCH/MCS-1	0	10	pass
	PDTCH/MCS-2	0	10	pass
	PDTCH/MCS-3	0	10	pass
	PDTCH/MCS-4	0	10	pass
	PDTCH/MCS-5	0	10	pass
	PDTCH/MCS-6	0	10	pass
	PDTCH/MCS-7	0	10	pass
	PDTCH/MCS-8	0	10	pass
	PDTCH/MCS-9	0	10	pass
	USF/MCS-1 to 4	0	1	pass
	USF/MCS-5 to 9	0	1	pass
RA (no FH)	PDTCH/MCS-1	0	10	pass
	PDTCH/MCS-2	0	10	pass
	PDTCH/MCS-3	0	10	pass
	PDTCH/MCS-4	0	10	pass
	PDTCH/MCS-5	0	10	pass
	PDTCH/MCS-6	0	10	pass
	PDTCH/MCS-7	0	10	pass
	PDTCH/MCS-8	0	10	pass
	PDTCH/MCS-9	0	10	pass
	USF/MCS-1 to 4	0	1	pass
	USF/MCS-5 to 9	0	1	pass

Propagation conditions	Type of channel	BLER Test value (%)	Limit (%)	Result
HT (no FH)	PDTCH/MCS-1	0	10	pass
	PDTCH/MCS-2	0	10	pass
	PDTCH/MCS-3	0	10	pass
	PDTCH/MCS-4	0	10	pass
	PDTCH/MCS-5	0	10	pass
	PDTCH/MCS-6	0	10	pass
	PDTCH/MCS-7	0	10	pass
	PDTCH/MCS-8	0	10	pass
	PDTCH/MCS-9	0	10	pass
	USF/MCS-1 to 4	0	1	pass
	USF/MCS-5 to 9	0	1	pass

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## **EXHIBIT A - EUT PHOTOGRAPHS**

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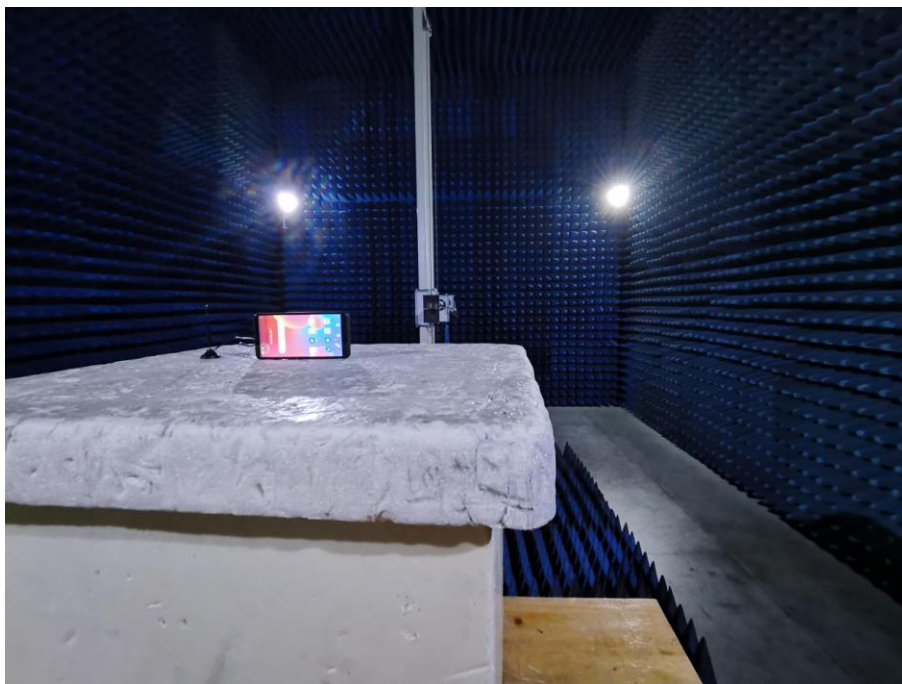
Please refer to the Attachment.

## **EXHIBIT B - TEST SETUP PHOTOGRAPHS**

**Radiated Spurious Emissions Test View (Below 1GHz)**



**Radiated Spurious Emissions Test View (Above 1GHz)**



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