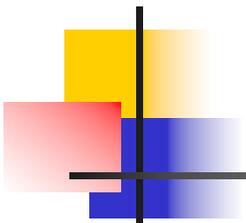


CMU200 基础应用培训

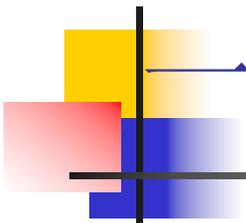
深圳市维瑞信科技有限公司

www.szwrx.net



CMU200 基础培训

1. CMU200 的功能、组成及操作
2. CMU200 的非信令模式测试
3. CMU200 的信令模式测试
4. CMU200 的维护
5. 测试实例



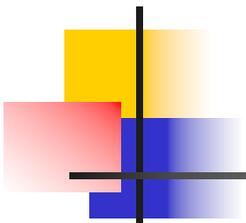
一 CMU200 的功能、组成及操作

1.1 CMU200 的功能介绍

1.2 CMU200 的组成结构

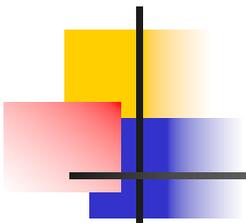
1.3 CMU200 硬件、软件选件

1.4 CMU200 的基本操作



1.1 CMU200的功能介绍

- CMU200在测试中模拟基站，通过Um接口，对无线终端产品的性能指标进行测试的综合测试仪。
- CMU200还能作为信号源以及频谱分析仪，跟其他仪表配合起来使用。
- 所支持的协议有：GSM400、900、1800、1900，TDMA IS 136，AMPS，CDMA IS 95，WCDMA，CDMA2000，EDGE。
- CMU200 具有较高的测试准确度和可靠性。
- CMU200具有较快的测试速度。
- CMU200 是模块化结构。



1.1 CMU200的功能介绍（续）

由于CMU200的基本单元中包含了信号源/功率计，示波器和简单的频谱分析仪的功能，CMU200广泛的应用于下列各个领域：

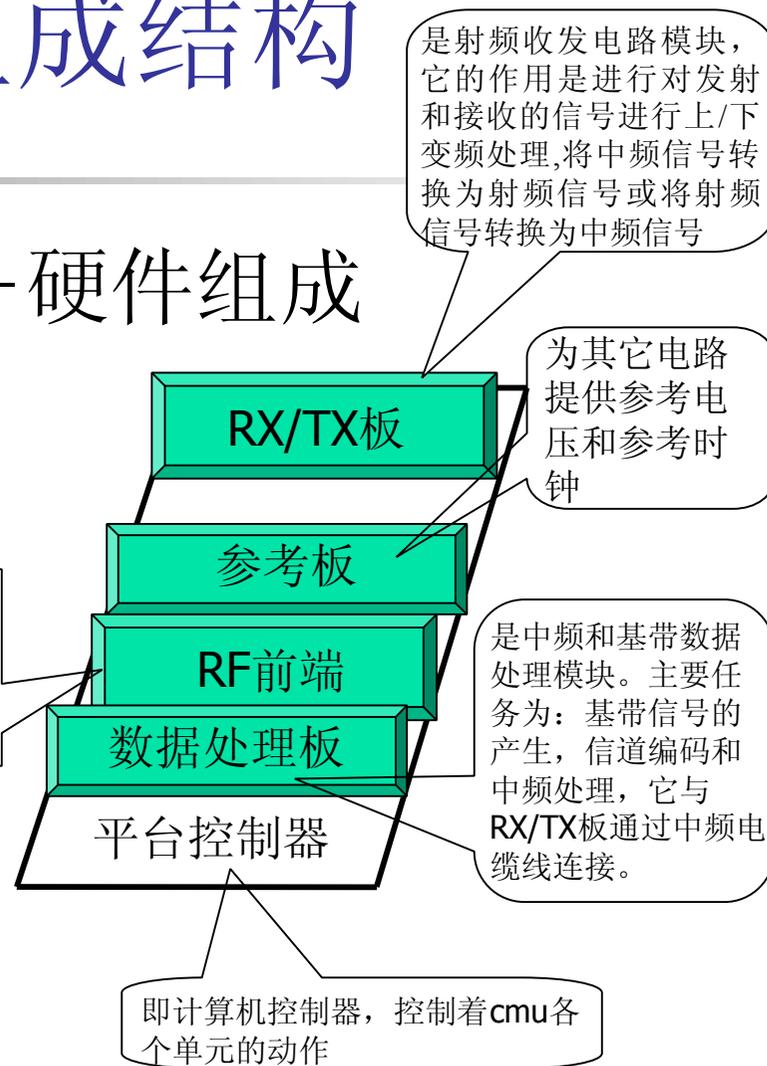
- RF开发
- 模块设计
- 生产中的模块测试
- 生产中的最终测试
- 功能测试
- 特性测试
- 高级维修
- 质量检验
- 测试系统的基本仪表
- 基站模拟

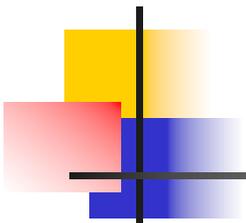
1.2 CMU200 的组成结构

■ CMU200的基本单元—硬件组成

1. 平台控制器
2. RX/TX板
3. 参考板
4. RF前端
5. 数据处理板

直接与CMU200的射频端口相连，内部有衰减矩阵和射频开关，同时负责这CMU200峰值功率的测量和处理





1.2 CMU200 的组成结构

- **CMU200的基本单元—软件组成**

- 版本管理器：**

- 是CMU200软件安装的版本管理和对CMU内部硬盘的操作。

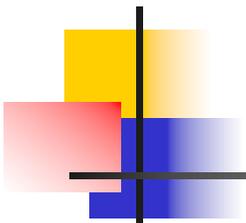
- BASE软件：**

- 与硬件单元一起完成CMU的基本测试和自身维护的功能。

1.3 硬件、软件选件

- 分为通用选件和专用选件

	名称	说明	名称	说明
通用选件	B11	基准晶体振荡器	B41	音频测试选件(电平/失真/频率测试)
	B12	高稳定度晶体振荡器	B15	附加的RF和IF连接
	B17	是I/Q中频信号接口	B66	通用基带板
	Z10	天线耦合器	Z11	屏蔽箱
专用选件	B21	通用的信令单元	K22	DCS1800测试软件
	B52	GSM 的音频编解码器	K23	PCS1900测试软件
	K45	支持AMR	K20	GSM400测试软件
	K21	GSM900测试软件	K24	GSM850测试软件



1.4 CMU200 的基本操作

- 1.4.1 CMU200的控制面板
- 1.4.2 CMU200的按键及接口
- 1.4.3 外围设备的连接与设置

控制器连接

外部键盘连接

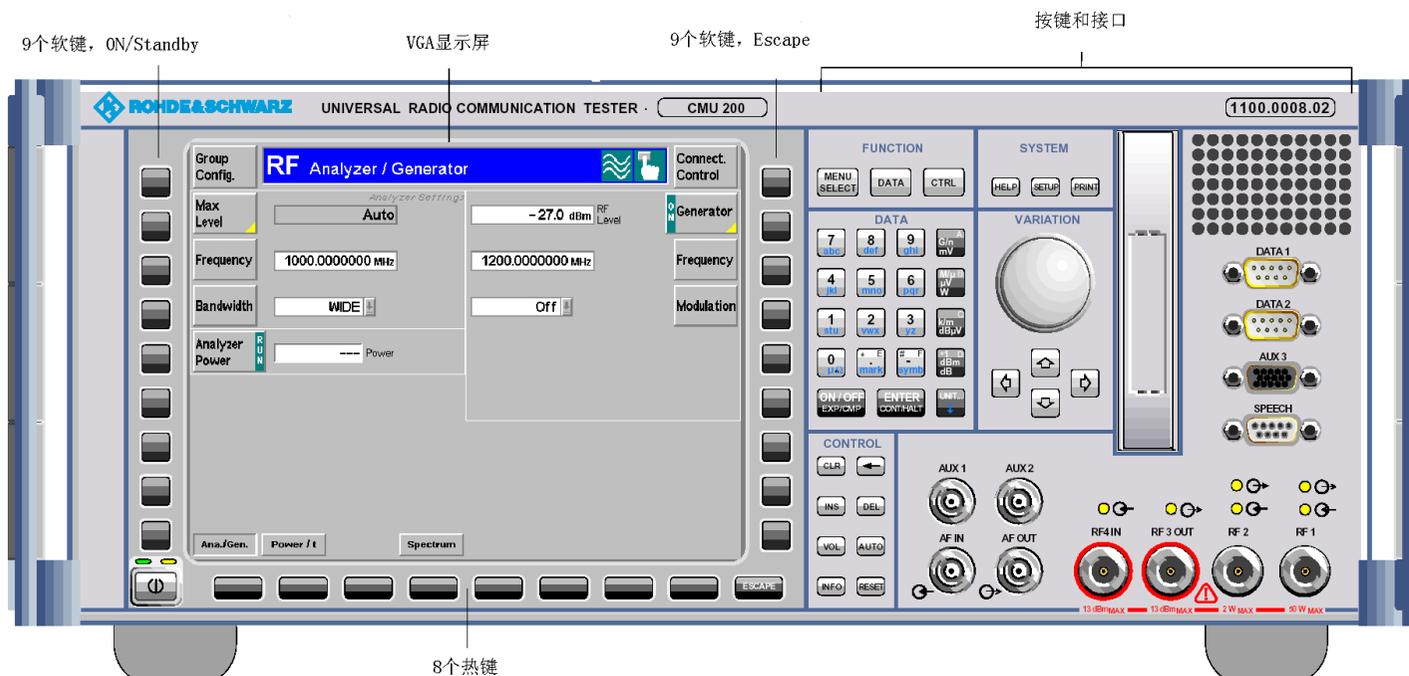
外部显示器连接

外部打印机 连接

外部同步设备的连接

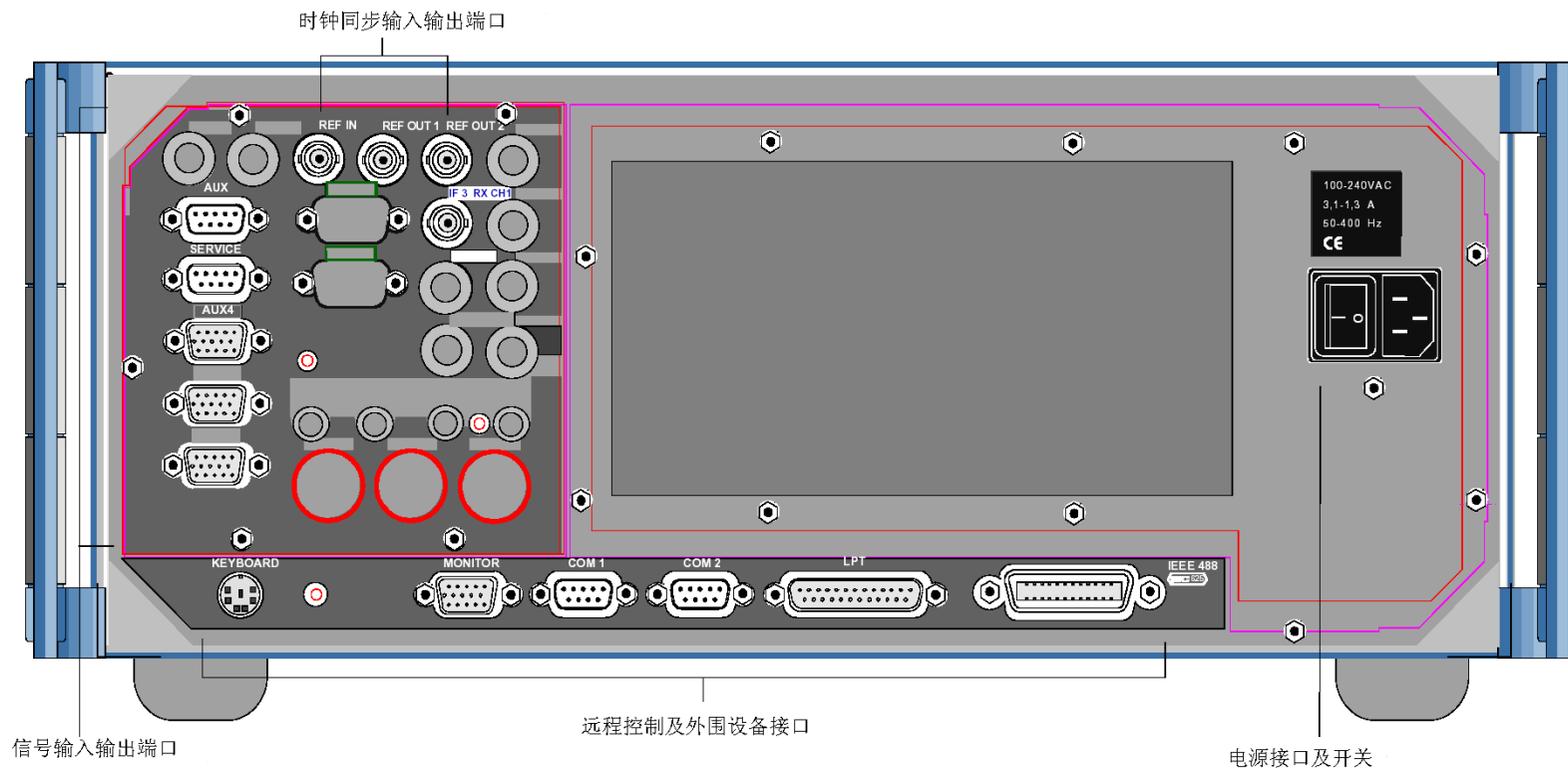
1.4.1 CMU200的控制面板

- CMU200的前面板主要是由VGA显示屏以及VGA两旁的软件以及下面的热键和右面的各类硬按键（FUNCTION、SYSTEM、DATA、VARIATION、CONTROL）以及各类接口组成。下图为CMU200的前视图。

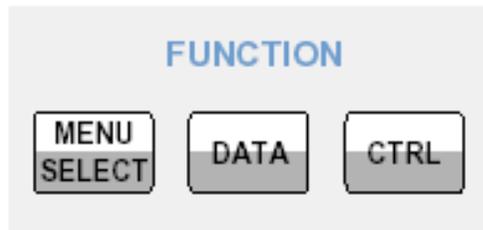


1.4.1 CMU200的控制面板

- CMU200的后面板如下图所示，主要由信号、同步的输入输出口以及远程控制、外围设备的接口和电源及其开关组成。



1.4.2 CMU200的按键及接口



预选择菜单:

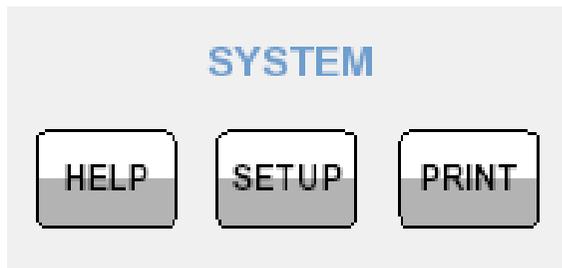
MENU SELECT 菜单选择
DATA 文件管理
CTRL 保留为以后扩展用



数据输入:

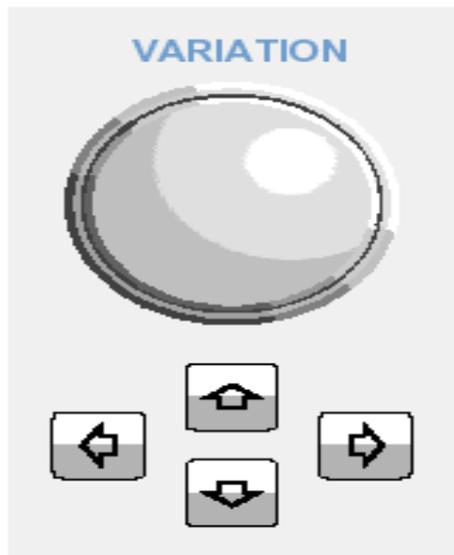
0...9 数字输入 **ENTER** 确认
*** . E** 特殊字符, 小数点, 十六进制“E”
_ F 特殊字符, 负号, 十六进制“F”
G/n mV A $10^9/10^{-9}$, 单位, 十六进制“**A**”
M/u uV W B $10^6/10^{-6}$, 单位, 十六进制“**B**”
K/m dB uV C $10^3/10^{-3}$, 单位, 十六进制“**C**”
***1 dBm dB D** 10^0 , 单位, 十六进制“**D**”
ON/OFF 编辑或者测试的打开/关闭
EXP/COMP
CONT/HALT 进入/退出编辑, 测试控制
UNIT 保留为以后扩展用

1.4.2 CMU200的按键及接口



系统控制:

HELP	保留为以后扩展用
SETUP	仪表设置
PRINT	打印



值可变按键和组选择:

转动旋钮 在输入域可变值，表中选择参数以及下拉菜单的选择。可用于扩大或压缩表，按下表示对所选内容的确认。

垂直光标键 在下拉菜单中选择中光标垂直移动

水平光标键 在下拉菜单中选择中光标水平移动

1.4.2 CMU200的按键及接口



ESCAPE 退出下拉菜单，关闭编辑框，取消确认。



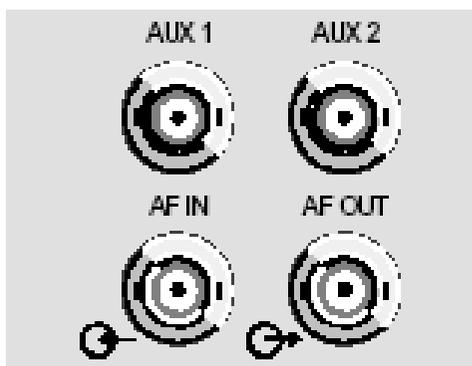
ON/STANDBY 测试模式跟待机模式的切换



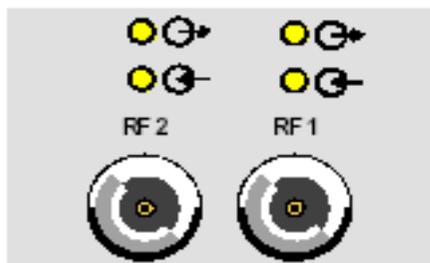
控制功能：

CLR 清除编辑的字符串
← 从右向左依次清除字符
INS 在编辑框中插入或者重写有关内容
DEL 依光标擦除字符
VOL 保留为以后扩展用
AUTO 保留为以后扩展用
INFO 系统信息和硬件诊断
RESET 恢复出厂设置

1.4.2 CMU200的按键及接口



AUX1/2 辅助音频信号输入输出，可能在远程控制中使用
AF IN/OUT 音频信号的主输入输出端口

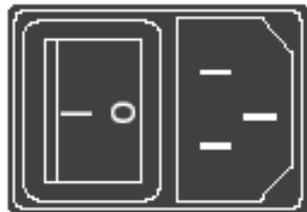


RF1 RF2 射频信号输入输出口
上面的指示灯表示射频信号相对与 **CMU** 是输入还是输出



RF3 OUT 射频信号输出口
RF4 IN 射频信号输入口

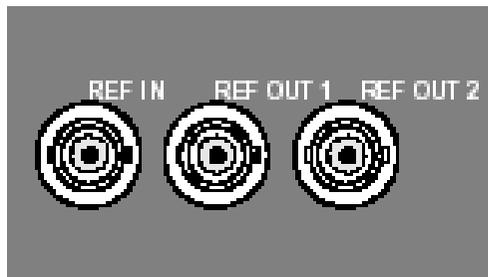
1.4.2 CMU200的按键及接口



主电源开
关
电源插头

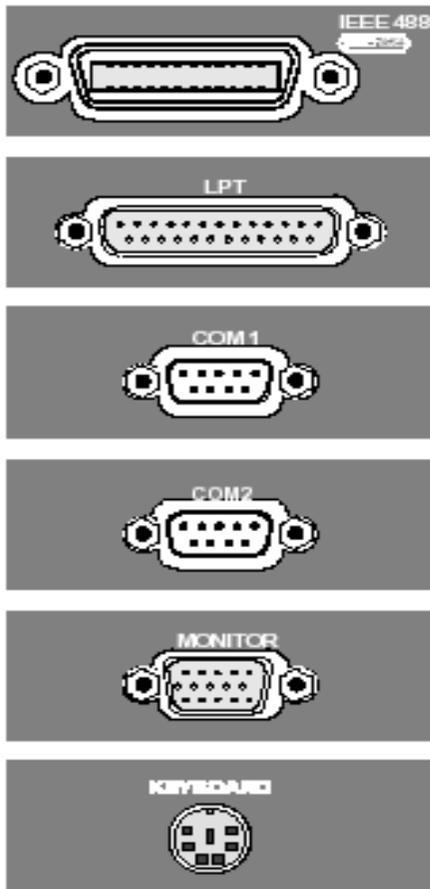


IF3 RX CH1
CMU接收机中频BNC接头



参考频率接口

1.4.2 CMU200的按键及接口



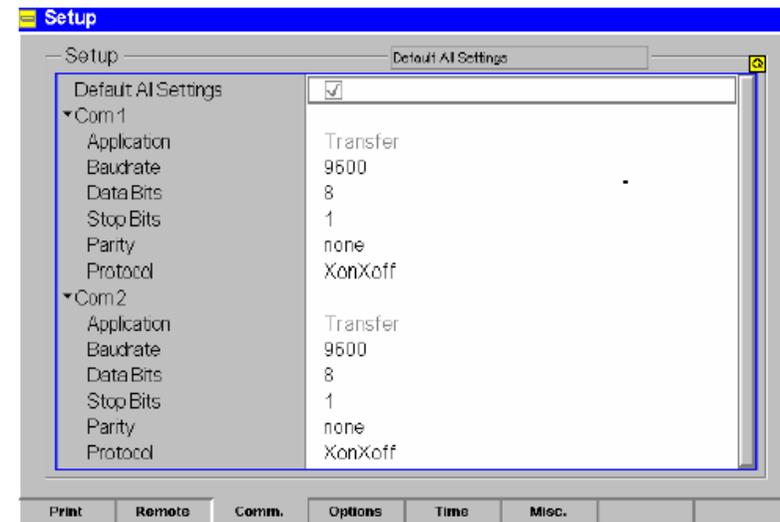
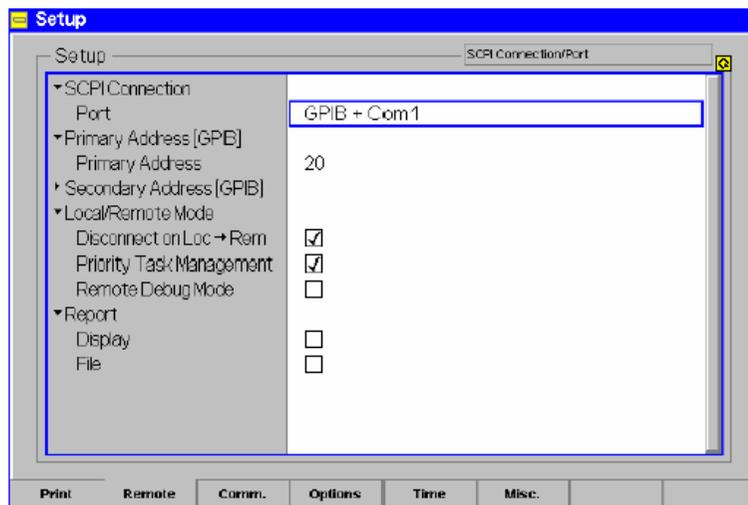
IEEE488	GPIB 线接口
LPT	25pin 并口
COM1	9pin 串口 1
COM2	9pin 串口 2
MONITOR	外置显示接口
KEYBOARD	键盘接口

1.4.3 外围设备的连接与设置

注意：连接外部设备时必须保证关机状态。

■ 控制器连接

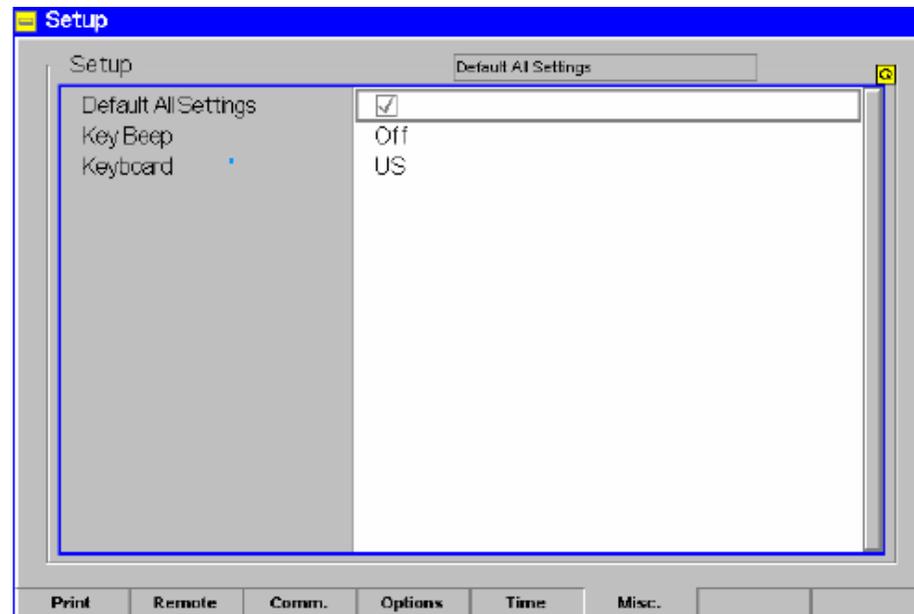
外部控制器可以通过GPIB或串口连接。在SETUP菜单的remote 或COMM. 页面进行配置。



1.4.3 外围设备的连接与设置

■ 外部键盘连接

PC键盘可以通过cmu的USB接口连接，在SETUP按键的MISC.页面对其配置及语言选择。



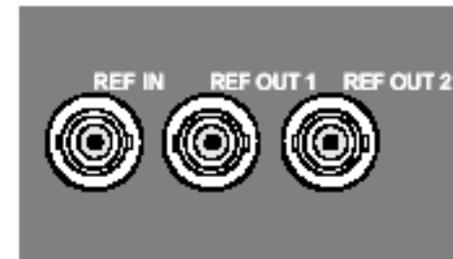
1.4.3 外围设备的连接与设置

■ 外部显示器连接



外接的VGA显示器可以通过15针SUB-D连接头连接到CMU200。

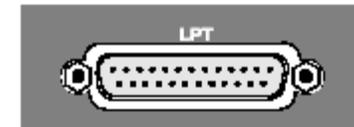
■ 外部同步设备的连接



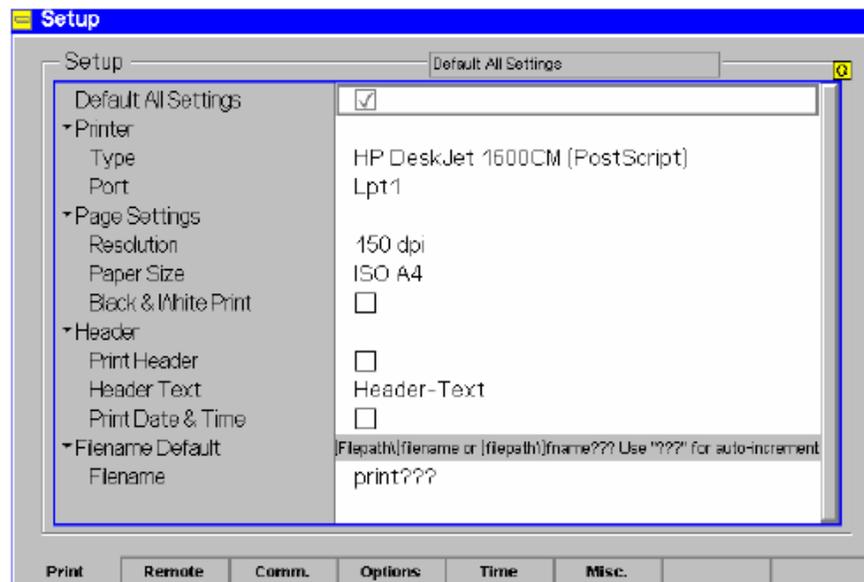
通过三个BNC连接器（REF in，REF out1，REF out2）连接外围同步设备

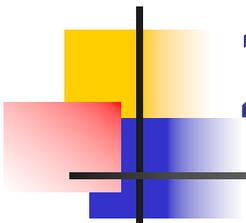
1.4.3 外围设备的连接与设置

■ 外部打印机连接



打印机可以通过并行接口LPT或串口1、2连接。在SETUP按键的PRINT页面面对其配置。





2. CMU200 的非信令模式测试

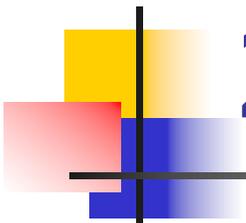
2.1 Analyzer/Generator Menu

2.2 Power Measurements

2.3 Modulation Measurements

2.4 Spectrum Measurements

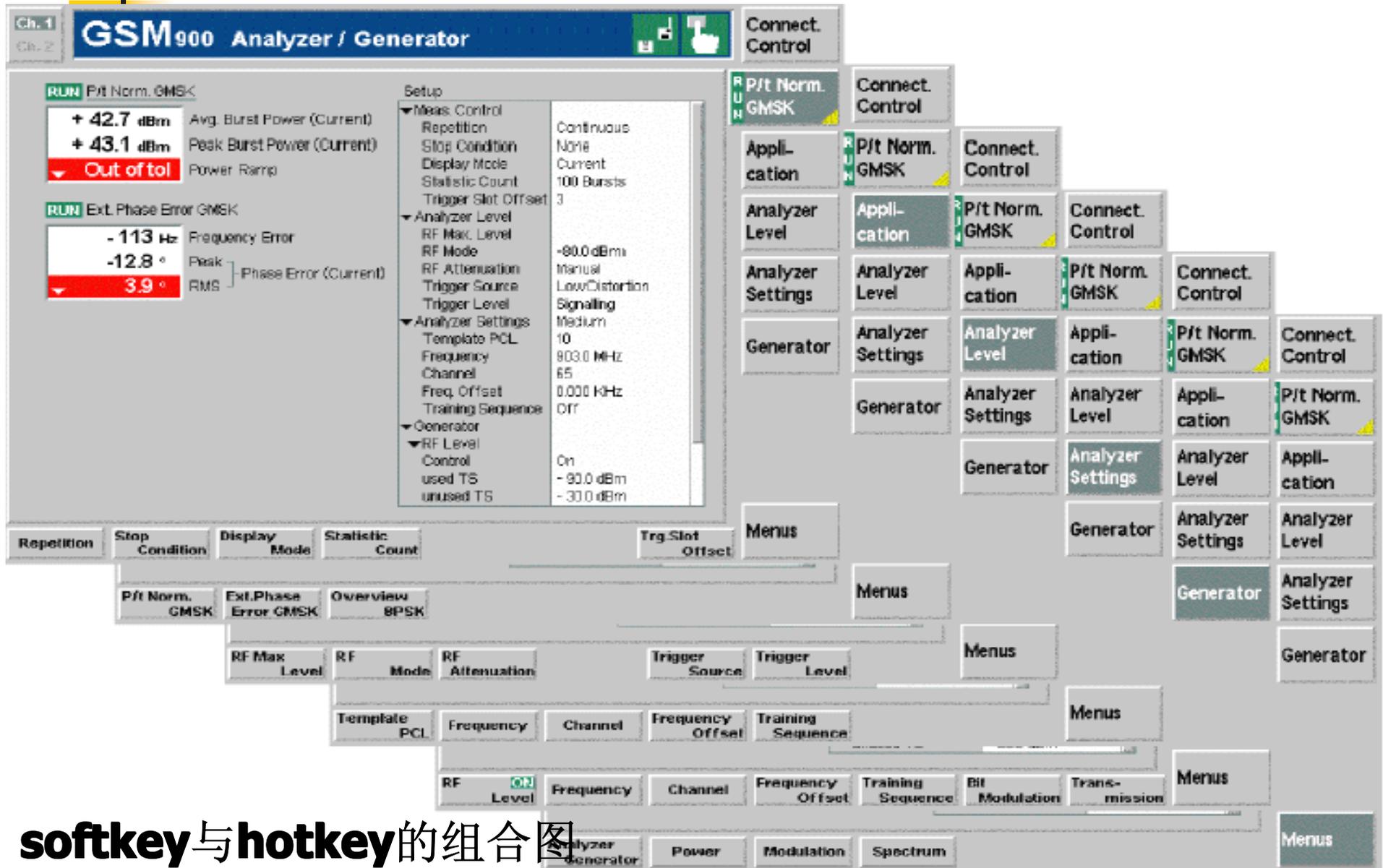
2.5 Connection Control



2.1 Analyzer/Generator Menu

- Analyzer/Generator菜单提供了快速进行普通的功率和调制测量，并且在瞬间得出基本的测试结果。
- 测量应用： **P/t Norm.GMSK, Ext. Phase Err. GMSK, Overview 8PSK** 三个测试应用。
- 通用设置(**generally setting**): 的改变将影响到测试组的测量和应用。通用设置都在**Connection Control**菜单设置。
- 专用设置 (**specific setting**): 仅与当前应用有关的设置，与其它应用独立。
- 测量结果输出： Analyzer/Generator菜单的左半面显示当前的测量结果。
- 通过相应的软键和热键组合进行配置。

2.1 Analyzer/Generator Menu



2.1 Analyzer/Generator Menu

- **P/t Norm. GMSK**

P/t Norm.
GMSK

- **测量控制:** P/t Norm. GMSK 软键 控制着测量应用和状态指示(**RUN | HLT | OFF**). 可以通过**ON/OFF** 或 **CONT/HALT**改变状态。

- **应用选择:**

P/t Normal
GMSK

Ext. Phase
Err. GMSK

Overview
8PSK

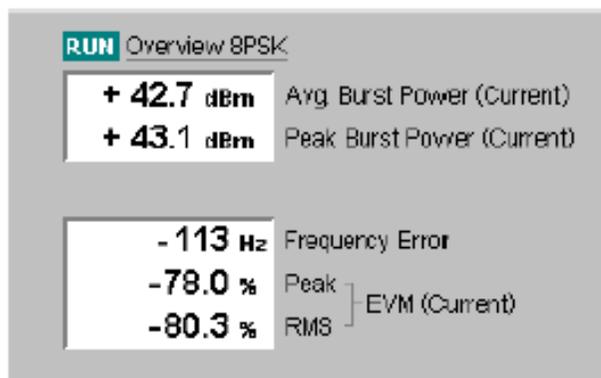
- **专用设置:** 参看2.5节

2.1 Analyzer/Generator Menu

- 结果输出:

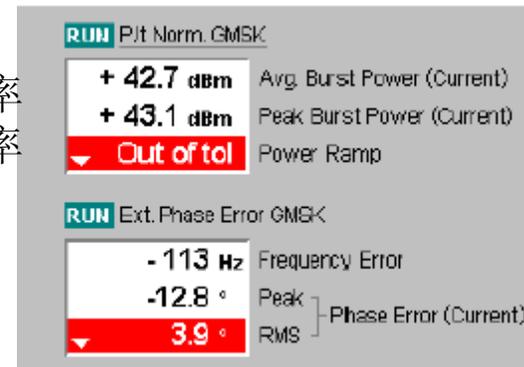
P/t Norm. GMSK 和 Ext. Phase Error GMSK, 由于可以并行运行, 所以可以同时显示。测试结果输出如图所示。

所有的值都是当前包络的测量, 没有比较和概率统计。



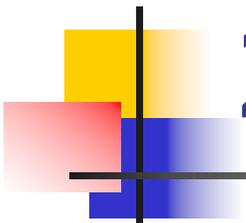
当前包络的平均功率
当前包络的峰值功率

频率误差
当前EVM (峰值和RMS)



当前包络的平均功率
当前包络的峰值功率
功率斜坡

频率误差
相位误差 (peak and RMS)



2.2 Power Measurements

- 功率测量组就是测试MS发射机的RF输出功率。
- 功率测量作为时间的函数在单个时隙或4个连续时隙。
- 在APPLICATION 菜单可以选择的应用有：



- 测量控制：相应的测试有 (RUN | HLT | OFF) 状态. 可以通过 ON/OFF 或 CONT/HLT 改变。

2.2 Power Measurements

P/t Norm.
GMSK

- Repetition
- Stop Condition
- Display Mode
- Statistic Count
- Trig. Slot Offset

测量的组合键有：

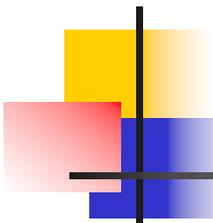
测量的重复模式(**single shot ,continuous**)

停止条件(**none, on limited failure**)

显示模式(决定测试曲线的显示模式)

统计数量(统计周期内的包络数)

测量时隙和触发时间之间的延迟(**GSM时隙的整数**)



2.2 Power Measurements

Analyzer
Level

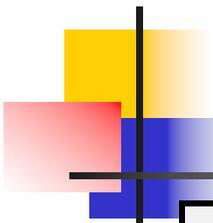
RF Max.
Level

RF
Mode

RF
Attenuation

Trigger
Source

Trigger
Level



2.2 Power Measurements

Analyzer Settings

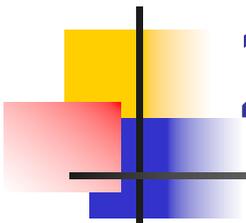
Template
PCL

Frequency

Channel

Frequency
Offset

Training
Sequence



2.2 Power Measurements

**Generator
Settings**

RF Level

Frequency

Channel

Frequency
Offset

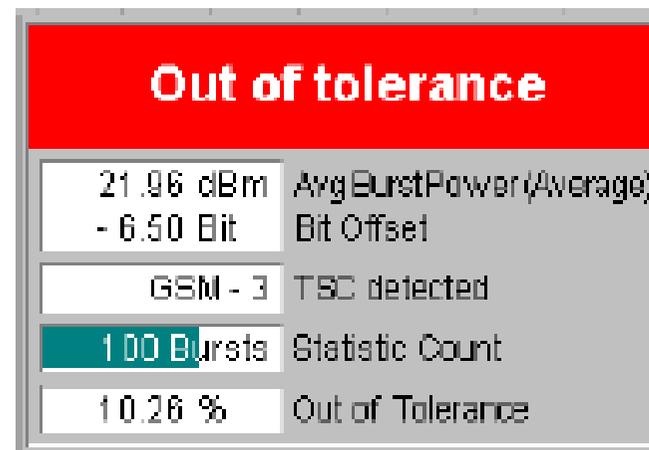
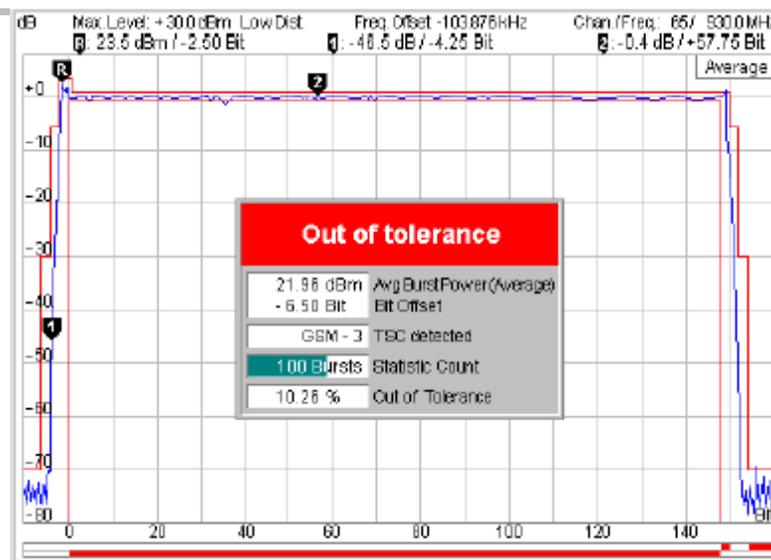
Training
Sequence

Bit
Modulation

Trans-
mission

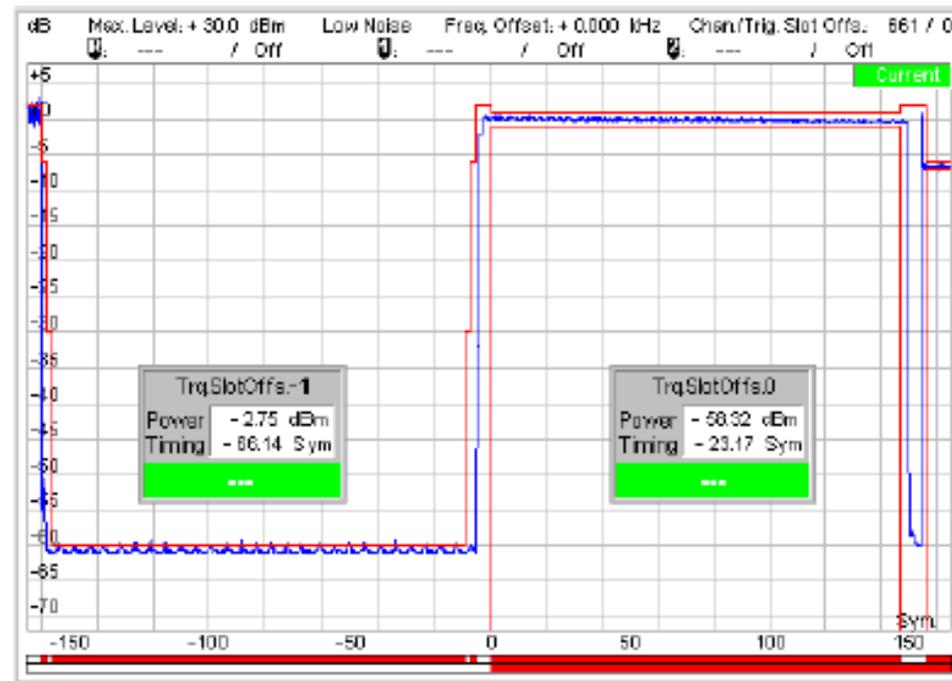
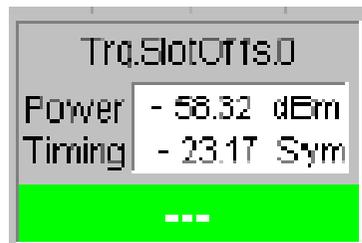
2.2 Power Measurements

- 测量结果:
- P/t Normal GMSK的测试结果输出如右图。
- **Bit Offset:** 包络关于时间轴的偏移。
- **Statistic count:** 每个统计周期内的包络数量。
- Avg Burst Power:
- TSC detected:GSM-(0-7) (Dummy | ---)
- Out of Tolerance: 超出限制线的相对包络数量。

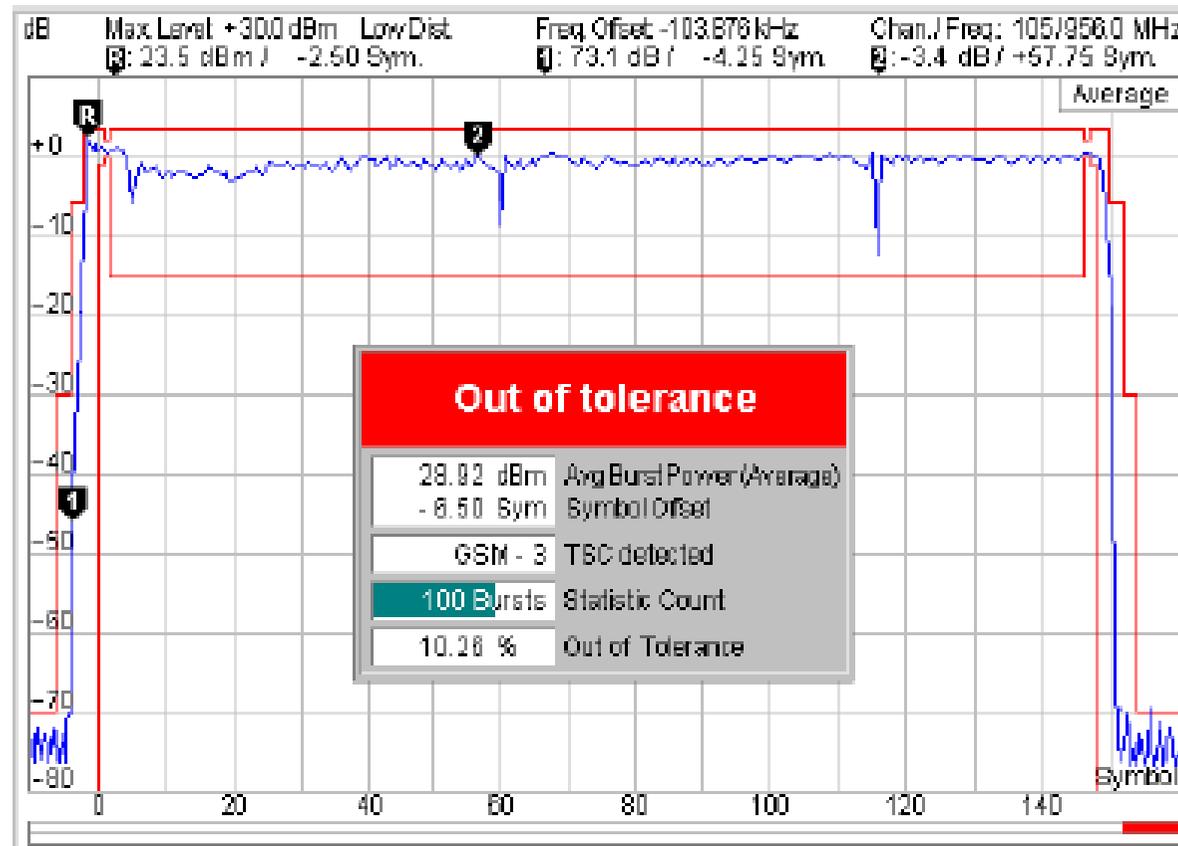


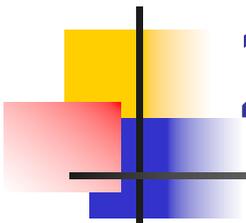
2.2 Power Measurements

■ P/t Multislot



2.2 Power Measurements





2.2 Power Measurements

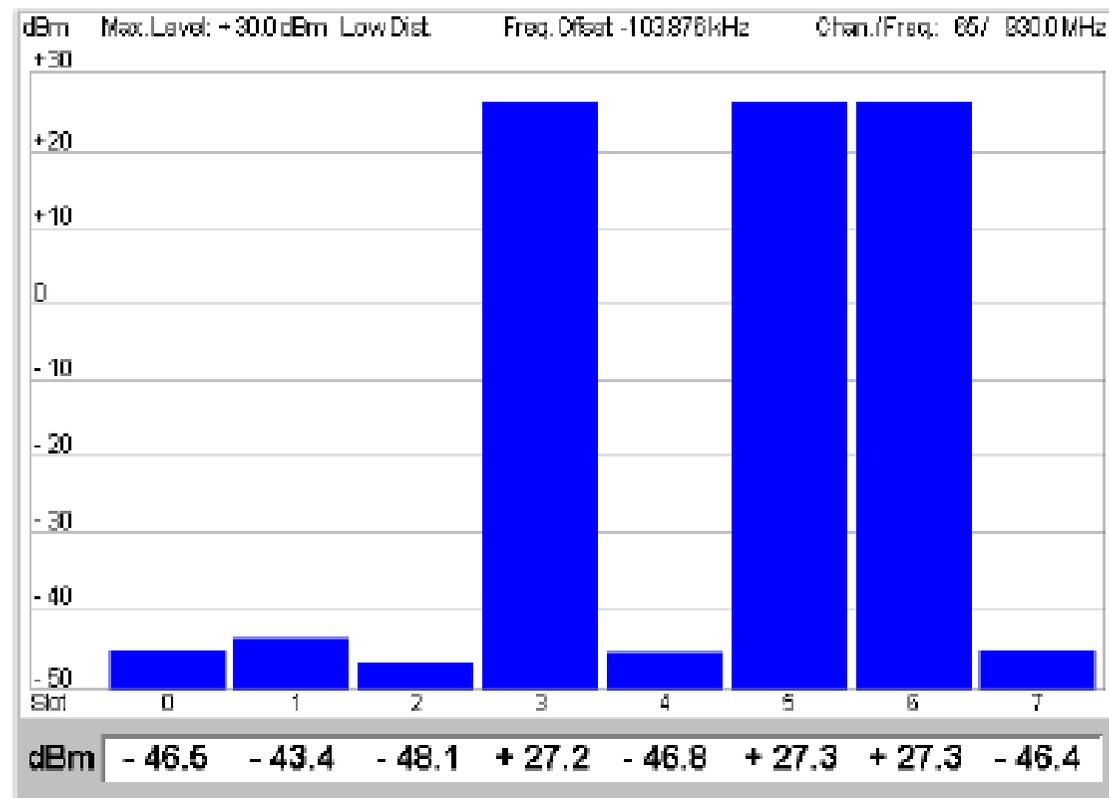
- **P/Frame**

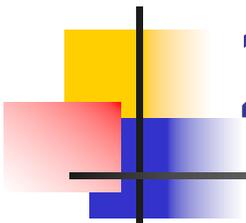
Frame		Max.Level: +30.0 dBm LowDist			Freq.Offset: -103.876kHz		Chan./Freq.: 66/ 830.0MHz		
0..	7	-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
8..	15	-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
16..	23	-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
24..	31	-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
32..	39	-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
40..	47	-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
48..	55	-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
56..	63	-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
64..	71	-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
72..	79	-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
80..	87	-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
88..	95	-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
96..	103	-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
104..	111	-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
112..	119	-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
120..	127	-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4

all results in dBm

2.2 Power Measurements

■ P/Slot Graph





2.2 Power Measurements

- **P/Slot Table**

Slot		Max. Level +30.0 dBm LowDist			Freq. Offset -103.876 kHz		Chan./Freq: 65/ 9300 MHz		
0.. 7		-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
8.. 15		-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
16.. 23		-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
24.. 31		-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
32.. 39		-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
40.. 47		-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
48.. 55		-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
56.. 63		-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
64.. 71		-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
72.. 79		-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
80.. 87		-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
88.. 95		-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
96.. 103		-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
104.. 111		-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4
112.. 119		-49.0	-48.7	-47.3	+26.8	-46.3	+27.1	+26.7	-47.1
120.. 127		-46.6	-43.4	-48.1	+27.2	-46.8	+27.3	+27.3	-46.4

all results in dBm

2.2 Power Measurements



Power Configuration 03/18/00

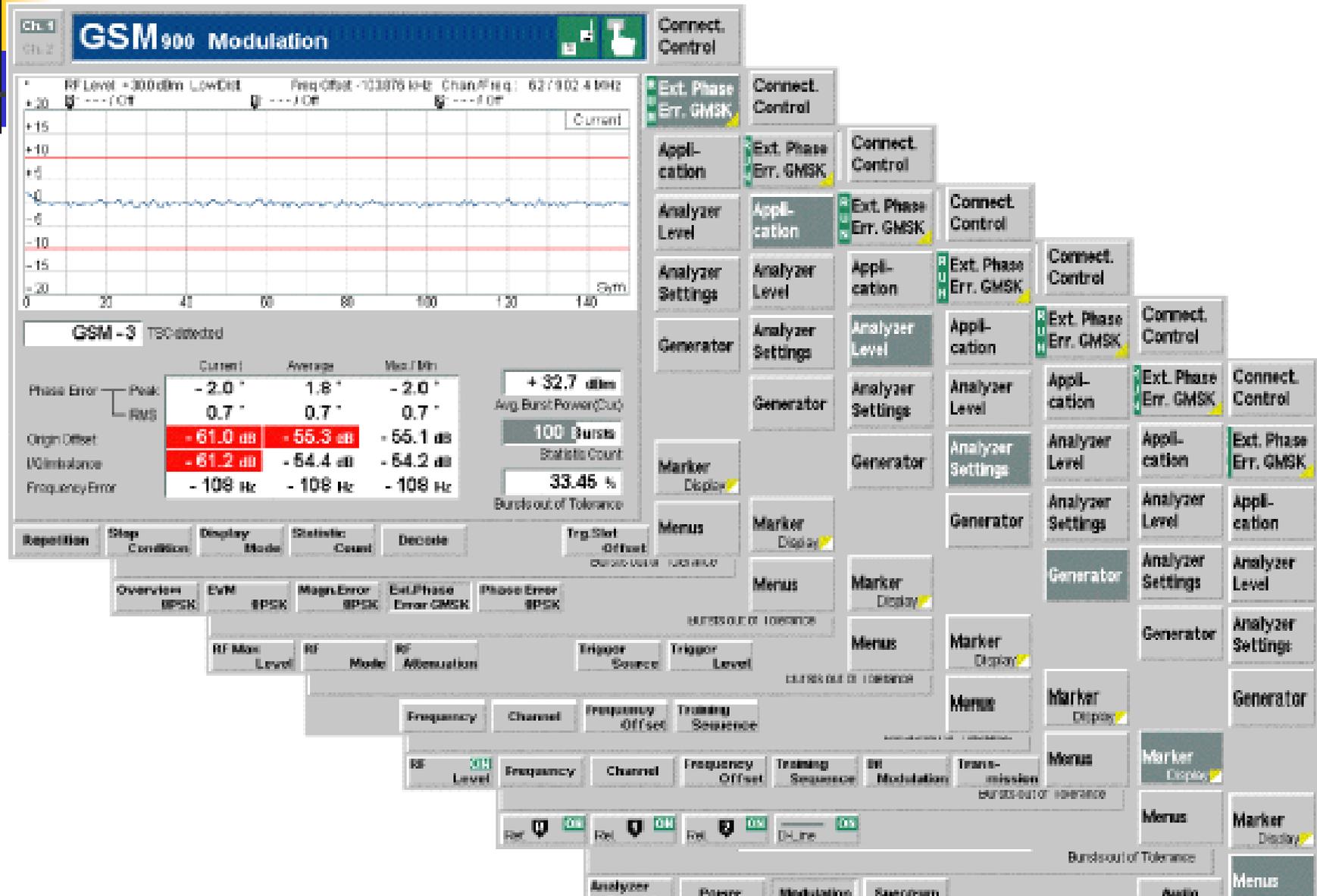
Control **Limit Lines** Limits

Setup P/t 8PSK Multislot

▾ P/t 8PSK Multislot	
Default Settings	<input checked="" type="checkbox"/>
RefPower Mode	Current
▾ P/t Normal GMSK	
Default Settings	<input checked="" type="checkbox"/>
Repetition	Continuous
Display Mode	Current
Stop Condition	None
Statistic Count	100 Bursts
Filter	500 kHz Gauss
Grid	On
▾ P/t Normal 8PSK	
Default Settings	<input checked="" type="checkbox"/>

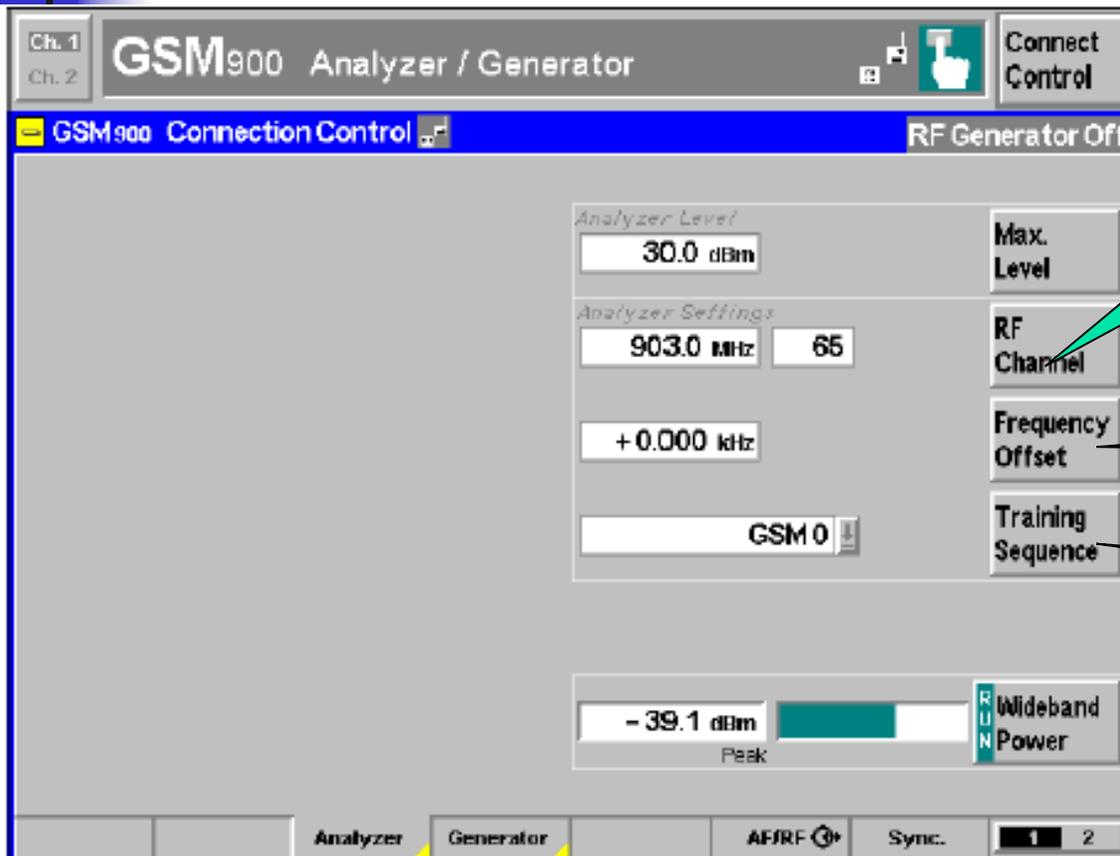
Compress

2.3 Modulation Measurements



2.5 Connection Control

RF Analyzer Settings (Connection Control – Analyzer)



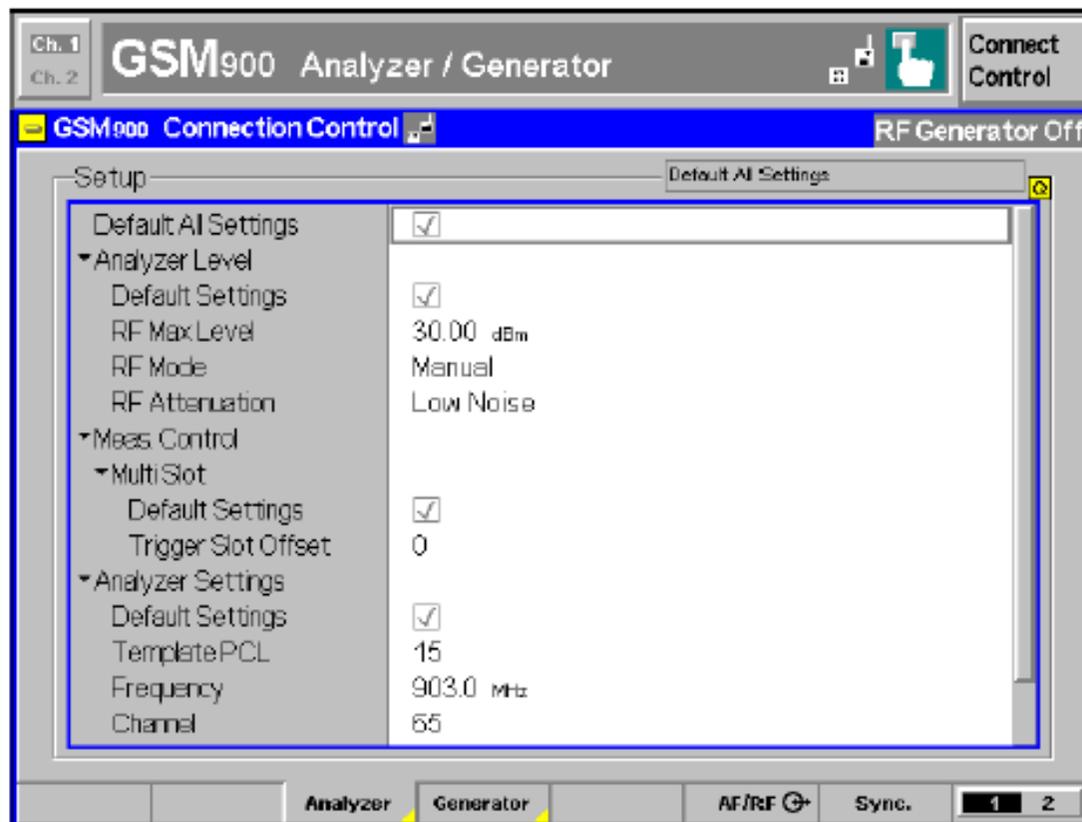
For gsm900:
ARFCN:1,62,124
FOR DCS1800
ARFCN:512,698,884

信号的频率与射频信道的偏移量。

GSM 0 to GSM 7

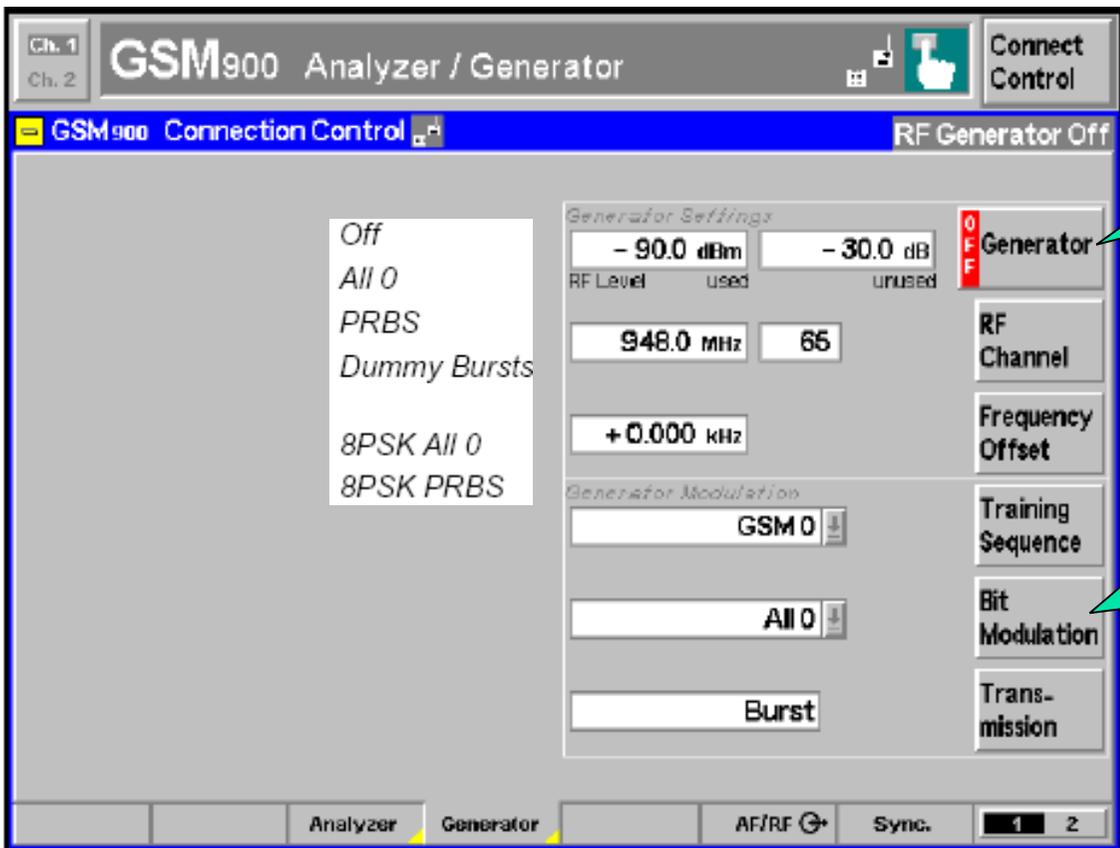
2.5 Connection Control

- 通过第二次点击Analyzer热键，进入配置菜单。



2.5 Connection Control

Generator Settings (Connection Control – Generator)

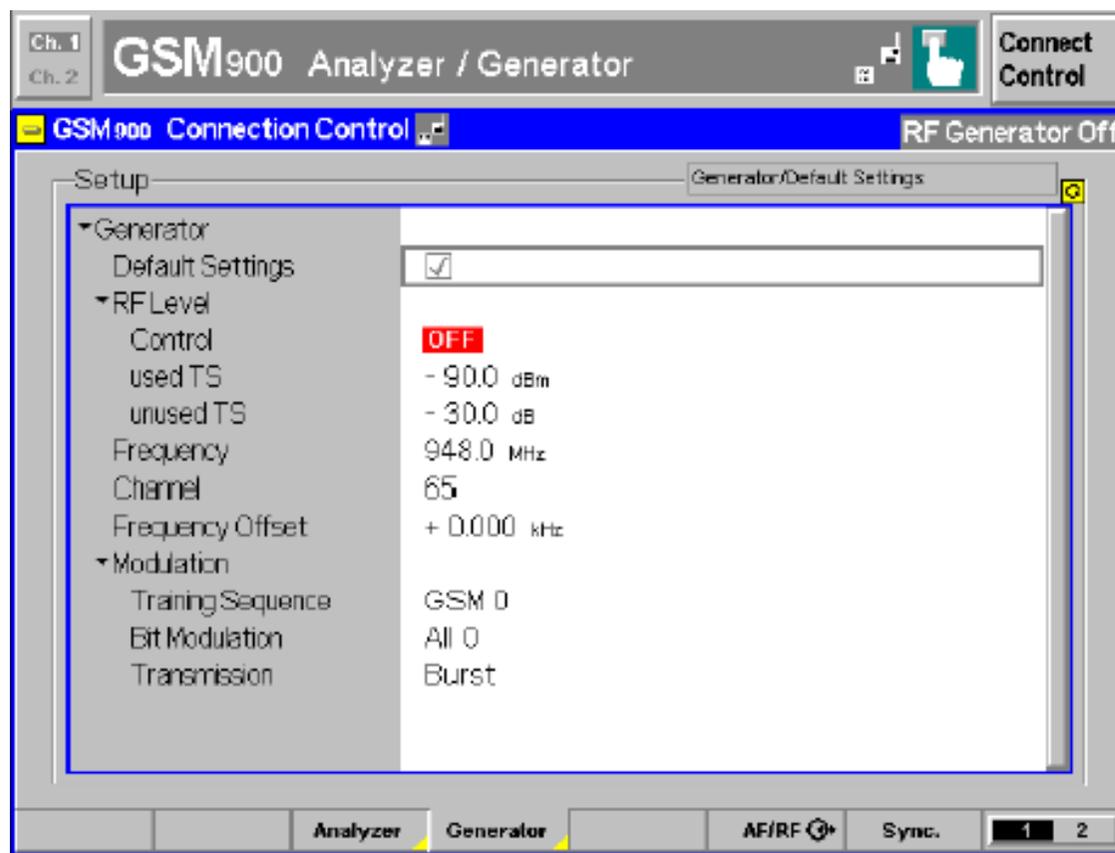


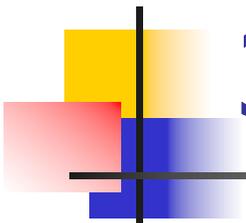
Used Ts RF Level in dBm absolute
Unused in dB relative

Off
All 0
PRBS
Dummy burst
8PSK ALL0
8PSKPRBS

2.5 Connection Control

- 通过第二次点击Generator热键，进入配置菜单



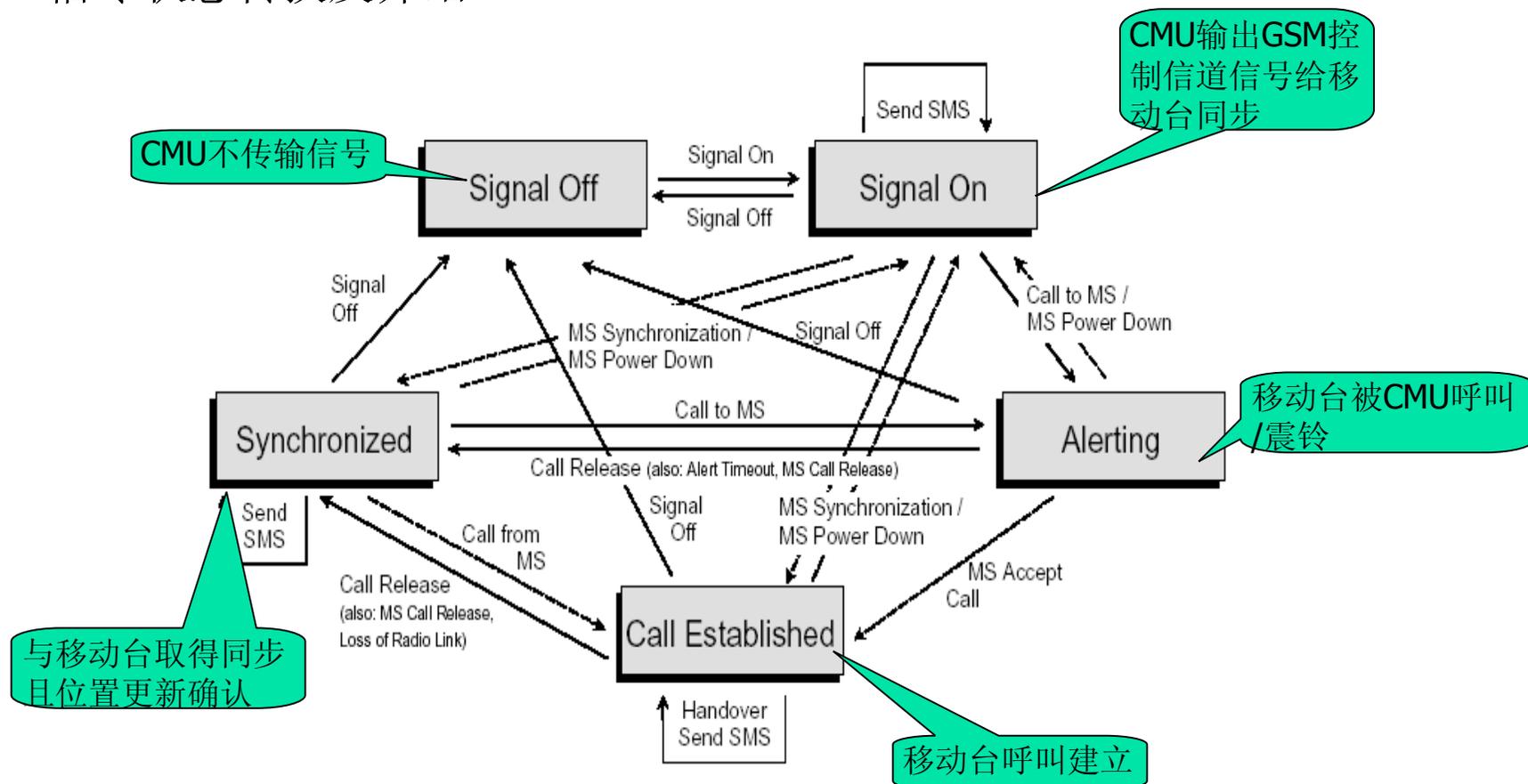


3. CMU200 的信令模式测试

- 3.1 CMU的5钟信令状态
- 3.2 测试准备
- 3.3 Connection Control
- 3.4 Overview
- 3.5 Power Measurements
- 3.6 Modulation Measurements
- 3.7 Spectrum Measurements
- 3.8 Receiver Quality Measurements

3.1 CMU的5种信令状态

- 信令状态转换及介绍



3.1 CMU的5钟信令状态

- Signal off

The screenshot displays the 'GSM900 Connection Control' software interface. The top bar shows 'Ch. 1 GSM900 Overview' and 'Ch. 2' with a 'Connect Control' button. The main window title is 'GSM900 Connection Control' and the status is 'Signal Off'. A central message box instructs the user to 'Press the Signal On key to enable the synchronization signal (BCCH)'. Below this, there are controls for 'Circuit Switched' (a dropdown menu), 'Main Service', 'Network Support', and 'Wideband Power' (with a 'RUN' indicator). A 'Peak' level is shown as '---'. On the left, a tree view shows 'Signalling States' expanded to 'MS Signal', with 'Timing Advance' at '0 Sym.', 'PCL (MS)' at '10 (23.0 dBm)', and 'Timeslot' at '3'. The bottom status bar includes 'Connection', 'MS Signal', 'BS Signal', 'Network', 'RF', 'Sync.', and 'Conn. Cfg.'.

Category	Value
MS Revision Level	---
P-GSM	---
E-GSM	---
R-GSM	---
GSM 1800	---
Circuit Switched	---
Packet Data	---
IMSI	-----
IMEI	-----
Dialled Number	---
Timing Advance	0 Sym.
PCL (MS)	10 (23.0 dBm)
Timeslot	3

3.1 CMU的5钟信令状态

- Signal on

The screenshot displays the 'GSM900 Connection Control' software interface. At the top, it shows 'Ch. 1 GSM900 Overview' and 'Ch. 2' with a 'Connect Control' button. The main window title is 'GSM900 Connection Control' and the status is 'Signal On'. The interface is divided into several sections:

- Left Panel (Tree View):**
 - Signalling States
 - MS Capabilities
 - MS Revision Level: ---
 - S.Bands/PowClass
 - P-GSM: ---
 - E-GSM: ---
 - R-GSM: ---
 - GSM 1800: ---
 - Multislot Class
 - Circuit Switched: ---
 - Packet Data: ---
 - Signaling Info
 - IMSI: -----
 - IMEI: ---
 - Dialled Number: ---
 - MS Signal
 - Circuit Switched
 - Timing Advance: 0 Sym.
 - Single Slot
 - PCL (MS): 10 (23.0 dBm)
 - Timeslot: 3
 - BS Signal
- Center Panel:**
 - Text: "Waiting for mobile synchronization or call from the mobile."
 - Mode: Circuit Switched
 - Network: GSM only
 - Peak: ---
- Right Panel (Buttons):**
 - Signal Off
 - Connect Mobile
 - Send SMS
 - Main Service
 - Network Support
 - Wideband Power (with 'RUN' indicator)

At the bottom, there is a navigation bar with tabs: Connection, MS Signal, BS Signal, Network, RF, Sync., and Conn. Cfg.

3.1 CMU的5钟信令状态

- synchronized

The screenshot displays the 'GSM900 Connection Control' window. The status bar at the top right indicates 'Synchronized'. The main area is divided into a left-hand tree view and a right-hand control panel.

Left Panel: Signalling States

- MS Capabilities
 - MS Revision Level: Phase II
 - S.Bands/PowClass
 - P-GSM: supported 4 (max. 33 dBm)
 - E-GSM: supported
 - R-GSM: not supported ---
 - GSM 1800: supported 1 (max. 30 dBm)
 - Multislot Class
 - Circuit Switched: ---
 - Packet Data: ---
 - Signaling Info
 - IMSI: 001.01.0123456789
 - IMEI: 446019.19.750759.00
 - Dialled Number: -
 - MS Signal
 - Circuit Switched
 - Timing Advance: 0 Sym.
 - Single Slot
 - PCL (MS): 10 (23.0 dBm)
 - Timeslot: 3
 - BS Signal

Right Panel: Control and Status

- Buttons: Signal Off, Connect Mobile, Send SMS, Main Service, Network Support, Wideband Power (RUN).
- Text: Make a call from the mobile or press the Connect Mobile key.
- Indicators: Circuit Switched, GSM only, Peak (---).

Bottom Bar: Connection Details

Connection	MS Signal	BS Signal	Network	RF	Sync.	Conn. Cfg.
------------	-----------	-----------	---------	----	-------	------------

3.1 CMU的5钟信令状态

■ Alerting

The screenshot displays the 'GSM900 Overview' software interface. The top bar shows 'Ch. 1 GSM900 Overview' and 'Ch. 2' on the left, and 'Circuit Switched Single Slot', a mobile phone icon, a hand icon, and 'Connect Control' on the right. Below this is a blue bar for 'GSM900 Connection Control' and a green bar for 'Alerting'. The main area is divided into a left table and a right control panel.

Signalling States		
MS Capabilities		
MS Revision Level	Phase II	
S.Bands/PowClass		
P-GSM	supported	4 (max. 33 dBm)
E-GSM	supported	
R-GSM	not supported	---
GSM 1800	supported	1 (max. 30 dBm)
Multislot Class		
Circuit Switched	---	
Packet Data	---	
Signaling Info		
IMSI	001.01.0123456789	
IMEI	446019.19.750759.00	
Dialled Number	-	
MS Signal		
Circuit Switched		
Timing Advance	0 Sym.	
Single Slot		
PCL (MS)	10 (23.0 dBm)	
Timeslot	3	
BS Signal		

Right Panel Controls:

- Call to mobile in progress.
- Signal Off
- Disconnect Mobile
- Circuit Switched
- Main Service
- GSM only
- Network Support
- 21.6 dBm Peak
- Wideband Power

Bottom Bar: Connection | MS Signal | BS Signal | Network | RF | Sync. | Conn. Cfg.

3.1 CMU的5钟信令状态

- Call established

The screenshot displays the GSM900 Power software interface. At the top, it shows 'Ch. 1 GSM900 Power' and 'Ch. 2'. The main window title is 'GSM900 Connection Control' with a 'Call Established' indicator. The interface is divided into several sections:

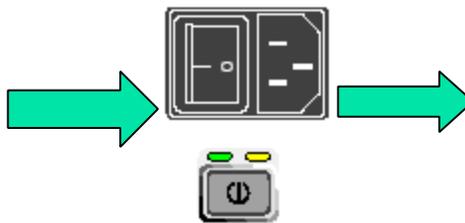
- Signalling States:** A tree view on the left showing various parameters like MS Capabilities, S.Bands/PowClass, Multislot Class, Signaling Info, MS Signal, and BS Signal.
- Release Call Instruction:** A central box with the text: "Release the call from the mobile or press the Disconnect Mobile key." Below this is a 'Disconnect Mobile' button.
- Service Selection:** A 'Circuit Switched' button is highlighted, and a 'GSM only' button is also visible.
- Power Level:** A power level indicator shows '21.5 dBm Peak' with a green bar graph.
- Wideband Power:** A 'Wideband Power' indicator is shown with a 'RUN' status.
- Bottom Navigation:** A series of buttons for 'Connection', 'Handover', 'MS Signal', 'BS Signal', 'Network', 'RF', 'Sync.', and 'Conn. Cfg.'.

3.2 测试准备

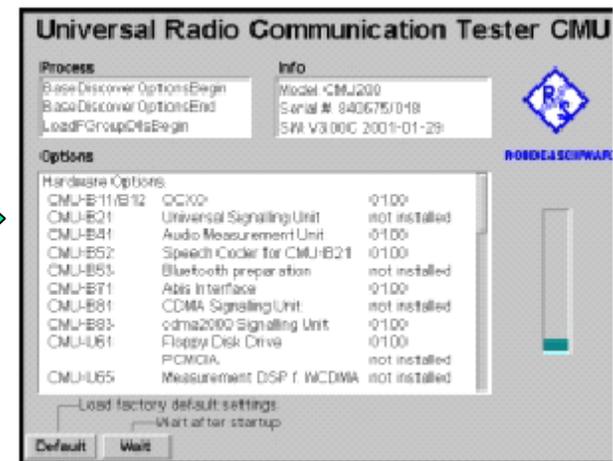
■ 连接



第一步：将已经插上SIM卡的移动台通过射频线连到CMU200的射频端口RF2。



第二步：将CMU电源插上。将CMU ON/Stand 置为ON。



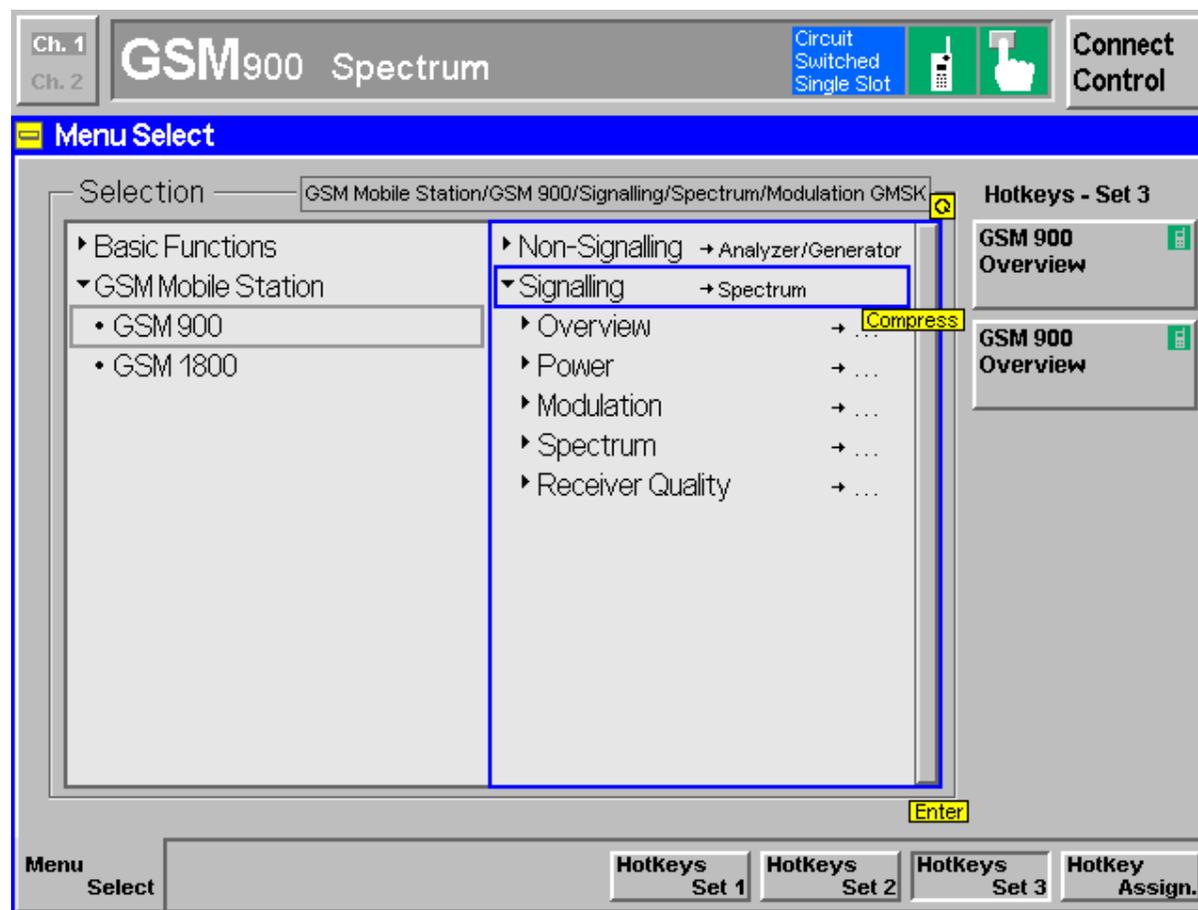
系统启动

3.2 测试准备

■ 设置

MENU
SELECT

按下MENU SELECT
即可进入右图所示
菜单。



3.3 Connection Control

- 在进行上述的各项测试之前，需要对Connect control 进行设置。

MS Signal: 设置

MS信号参数

BS Signal: 设置

BS信号参数

NETwork: 设置网

络参数

RF:设置RF

Input/output 端口

和链路损耗

The screenshot shows the 'GSM900 Connection Control' software interface. The main window is titled 'GSM900 Overview' and 'GSM900 Connection Control'. The interface is divided into several sections:

- Top Bar:** 'Ch. 1 GSM900 Overview', 'Ch. 2', 'Circuit Switched Single Slot', and 'Connect Control'.
- Left Panel:** A tree view for configuration, including 'Signalling States', 'MS Capabilities', 'S.Bands/PowClass', 'Multislot Class', 'Signaling Info', 'MS Signal', and 'BS Signal'.
- Center Panel:** A large text area displaying 'Waiting for mobile synchronization or call from the mobile.' Below it are fields for 'Circuit Switched' and 'GSM only', and a 'Peak' indicator.
- Right Panel:** A vertical stack of control buttons: 'Signal Off', 'Connect Mobile', 'Send SMS', 'Main Service', 'Network Support', and 'Wideband Power'.
- Bottom Bar:** A navigation bar with tabs for 'Connection', 'MS Signal', 'BS Signal', 'Network', 'RF', 'Sync.', and 'Conn. Cfg.'.

3.3 Connection Control

■ MS Signal

在signal on 状态下:

SLOT MODE:

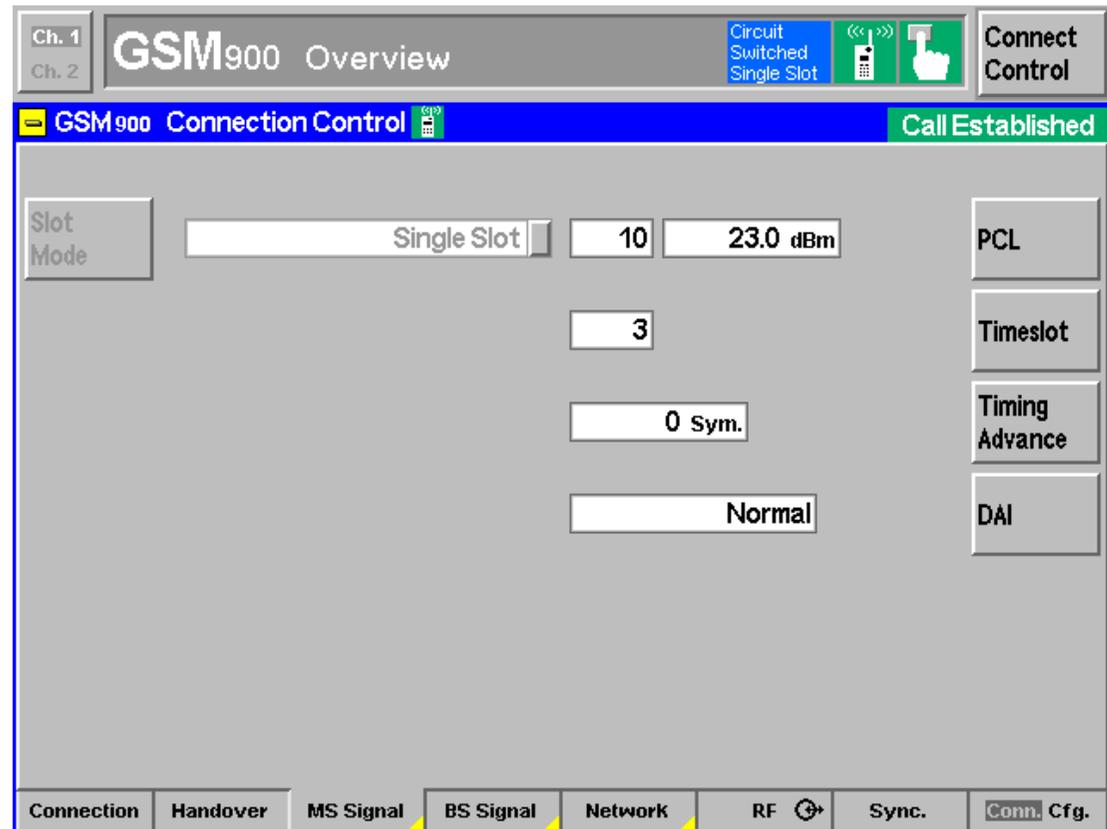
Single slot /multislot

PCL:GSM900(5~)

TimeSlot:(0~7)

TA:Symbol为单位,
(GMSK:1bit;8PSK:3bit)

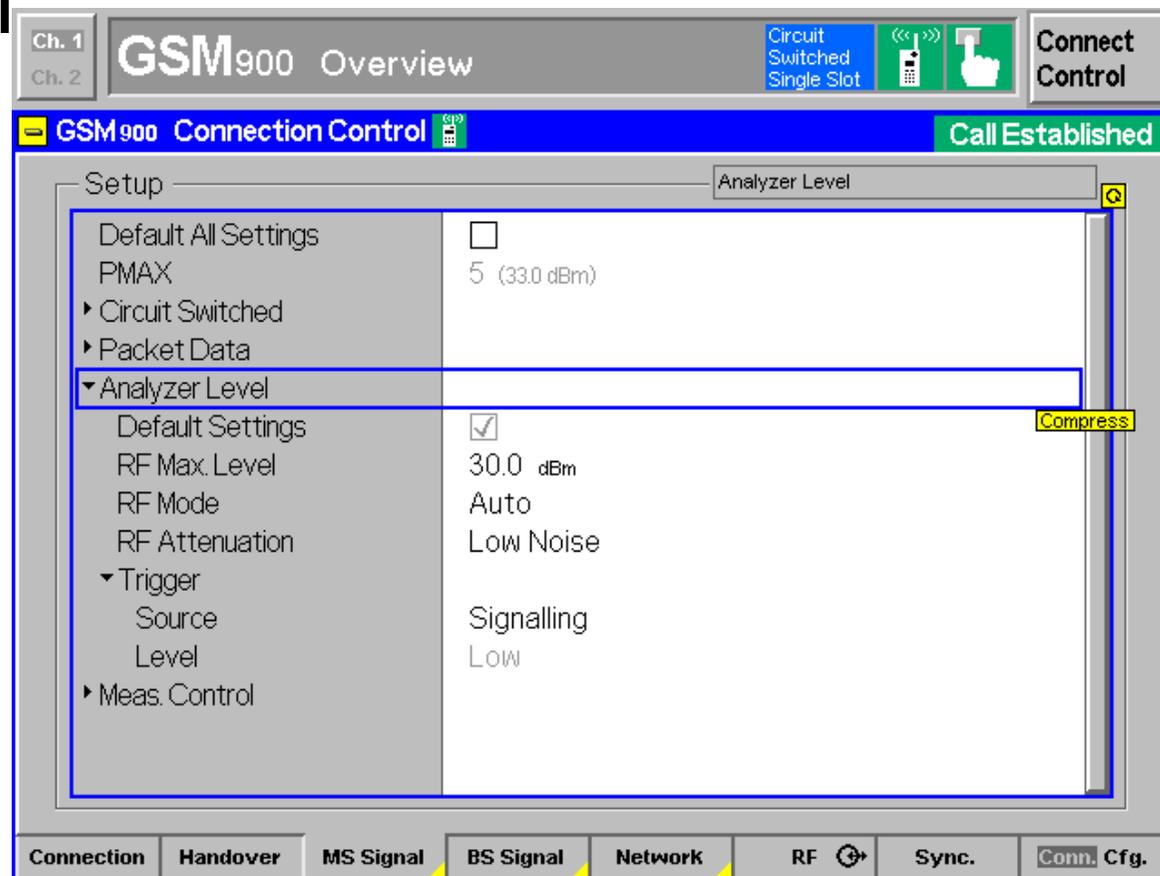
Loop:测试环回通道选择,
(A,B ,I,OFF)



3.3 Connection Control

■ MS Signal

第二次按下MS Signal
即可弹出setup窗口。
通过此窗口可以进一步
对MS进行设置。



3.3 Connection Control

■ BS Signal

可分为BCCH设置
和TCH信道设置。

The screenshot displays the 'GSM900 Overview' interface with the 'BS Signal' tab selected. The interface is divided into several sections for configuration:

- Ch. 1 / Ch. 2:** GSM900 Overview
- Buttons:** Circuit Switched Single Slot, Connect Control, Call Established
- Frequency Offset:** + 0 Hz
- Mode:** BCCH and TCH (under BCCH)
- Level:** - 85.0 dBm
- RF Channel:** 32
- TCH&BCCH TCH:** Single Slot
- TCH Level:** - 60.0 dBm (used) and - 20.0 dB (unused)
- RF Channel:** 62
- Timeslot:** 3
- Hopping:** Off

At the bottom, there is a navigation bar with tabs: Connection, Handover, MS Signal, BS Signal (selected), Network, RF, Sync., and Conn. Cfg.

3.3 Connection Control

■ BS SIGNAL

在此SETUP
菜单可以对BS侧的
设置进行修改或重
新设置。

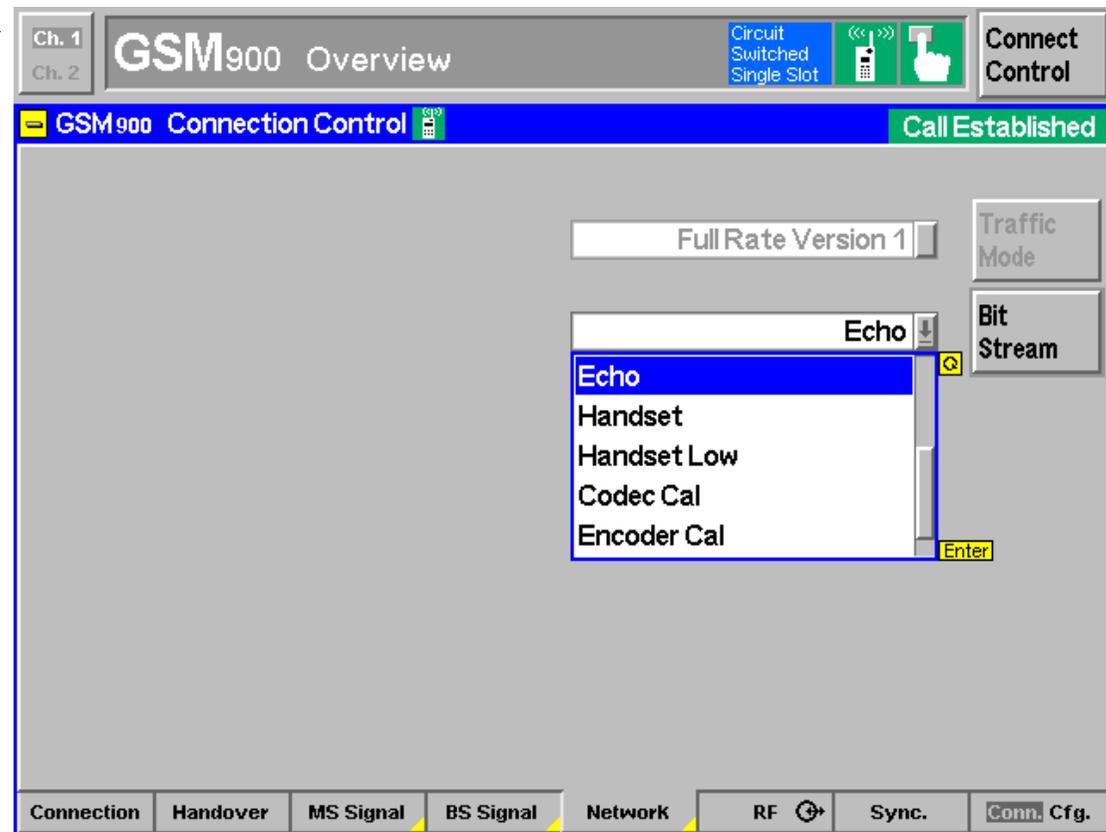
The screenshot displays the 'GSM900 Connection Control' interface. At the top, it shows 'Ch. 1' and 'Ch. 2' tabs, 'GSM900 Overview', and 'Circuit Switched Single Slot' status. A 'Connect Control' button is visible. The main area is titled 'GSM900 Connection Control' and 'Call Established'. The 'Setup' section is expanded to show 'Packet Data/Traffic Channel' settings. The 'Traffic Channel' section is highlighted, showing 'Idle' mode, 'P0' at 4 dB, and 'RF Channel' at 62. A 'Compress' button is located next to the P0 value. The bottom navigation bar includes 'Connection', 'Handover', 'MS Signal', 'BS Signal', 'Network', 'RF', 'Sync.', and 'Conn. Cfg.'.

Parameter	Value
Default All Settings	<input type="checkbox"/>
Frequency Offset	+ 0 Hz
Control Channel	
Level	- 85.0 dBm
RF Channel	32
Mode	BCCH and TCH
Circuit Switched	
Traffic Channel	
Packet Data	
Traffic Channel	Idle
P0	4 dB
RF Channel	62
Multi Slot	

3.3 Connection Control

■ NETWORK

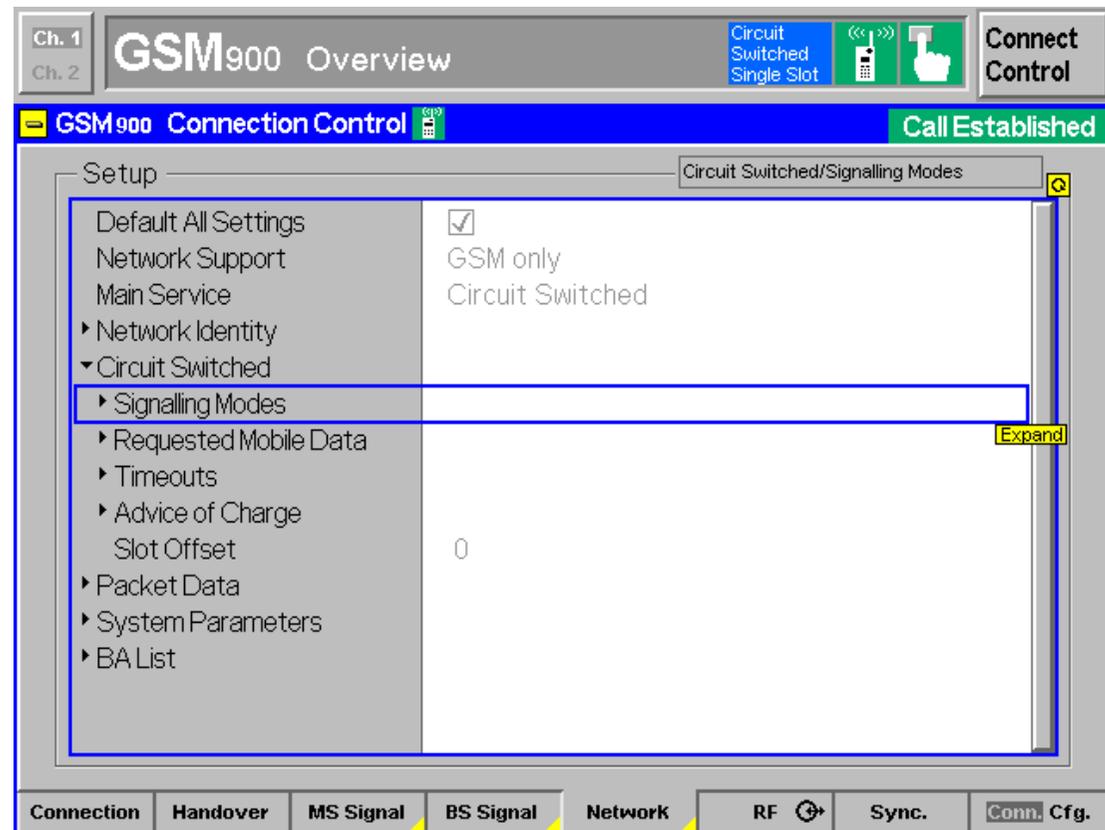
网络侧配置主要有：
业务模式选择和
BIT流的选择。



3.3 Connection Control

■ NETWORK

在此setup菜单可以对网络侧进行修改和重新配置操作。

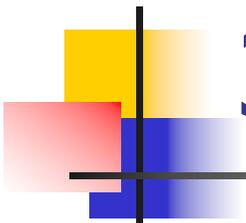


3.3 Connection Control

■ RF

RF Output和RF Input是选择测试所使用的输出/入射频端口；而Ext.Att Output和Ext.Att Input表示输入/出信道的射频补偿。每项配置完成后必须确定，否则设置无效。

The screenshot displays the 'GSM900 Connection Control' software interface. At the top, it shows 'Ch. 1 GSM900 Overview' and 'Ch. 2 GSM900 Connection Control'. The 'Call Established' status is visible in the top right. The main area is titled 'RF Connector Setup' and contains two sections for RF ports. The first section, 'RF Output', shows 'RF 3 OUT', 'RF 2', and 'RF 1' ports, each with a '+0.0 dB' value. The second section, 'RF Input', shows 'RF 4 IN', 'RF 2', and 'RF 1' ports, each with a '+0.0 dB' value. To the right of these sections are buttons for 'RF Output', 'Ext. Att. Output', 'RF Input', and 'Ext. Att. Input'. Below these sections, there is a 'Wideband Power' section showing '-0.3 dBm Peak' and a 'RUN' button. At the bottom, there is a navigation bar with tabs for 'Connection', 'Handover', 'MS Signal', 'BS Signal', 'Network', 'RF', 'Sync.', and 'Conn. Cfg.'.



3.4 Overview

- OVERVIEW菜单包括*P/t Norm. GMSK, Ext. Phase Err. GMSK, Overview 8PSK*三项测试。
- Overview是对移动台综合性能的一个评述，它包括了移动台作为发射机以及接收机时的主要性能指标，让我们对移动台的性能有一个基本了解。
- 后图为overview的一个组合图。不同的SOFTKEY对应的HOTKEY，操作时进行相应的配置。
- 选择信令模式Singalling->Overview，即可进入Overview。

3.4 Overview

The screenshot shows the 'GSM900 Overview' interface. The main display area is divided into several sections:

- Top Bar:** 'GSM900 Overview' title, 'Circuit Switched Single Slot' status, and 'Connect Control' button.
- Left Panel (RUN):**
 - P1 Norm. GSMK:** Reported Power (5(33.0 dBm)), Avg. Burst Power (31.4 dBm), Peak Burst Power (31.6 dBm), Power Ramp (Ok), Timing Advance Error (-0.75 Symb).
 - Ext. Phase Error GSMK:** Frequency Error (-4 Hz), Peak Phase Error (Current) (2.4 °), RMS (1.0 °).
 - MS Receiver Reports:** RX Level (20 (-91 to -80 dBm)), RX Quality (0 (0.0 to 0.3 %)), Discontinuous Transmission (DTX) (Off).
- Right Panel (Settings):**
 - Signaling Status
 - MS Capabilities
 - Signaling Info: IMSI (001010000000001), IMEI (000000 01 123456 0), Dialed Number (123), Traffic Mode (Full Rate Version 1)
 - Meas. Control: Repetition (Continuous), Stop Condition (None), Display Mode (Current), Statistic Count (100 Bursts)
 - Analyzer Level: RF Mode (Auto), RF Attenuation (Low Noise Signalling), Trigger Source (Rising Edge), Trigger Slope
 - MS Signal: Circuit Switched (Timing Advance: 0 Symb), Single Slot (PCL (MS): 0 (33.0 dBm))

Overlaid on the right side of the interface is a diagram showing the sequence of softkey and hotkey combinations for various menu items. The diagram consists of a grid of buttons labeled with menu names and their corresponding hotkey combinations:

- Connect Control:** P1t Norm. GSMK
- Application:** Application
- Analyzer Level:** Analyzer Level
- MS Signal:** MS Signal
- BS Signal:** BS Signal
- Network:** Network
- Menus:** Menus

Yellow bars are present at the bottom of the interface, likely representing a keyboard or touchpad area.

OVERVIEW的SOFTKEY与与之对应的HOTKEY组合图

3.4 Overview

- P/t Norm. GMSK

期望功率
平均突发功率
峰值突发功率
功率斜坡
时间提前量误差

频率误差
相位峰值误差
相位均方根误差

接收等级
接收质量

The screenshot displays the 'GSM900 Overview' interface. A green box labeled '数据输出' (Data Output) highlights the power-related metrics. A blue box highlights the phase error metrics. A purple box highlights the receiver quality metrics. The interface includes a 'Setup' panel on the right and a 'Menus' bar at the bottom.

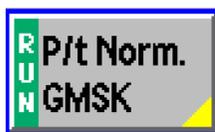
Metric	Value	Unit/Label
Reported Power	40	(23.0 dBm)
Avg. Burst Power (Current)	21.5	dBm
Peak Burst Power	21.6	dBm
Power Ramp	Ok	
Timing Advance Error	-0.25	Sym.
Frequency Error	2	Hz
Peak Phase Error (Current)	-5.9	°
RMS Phase Error	2.3	°
RX Level	48	(-63 to -62 dBm)
RX Quality	0	(0.0 to 0.2 %)

Setup Panel:

- Signalling States: Circuit Switched Single Slot
- MS Capabilities: IMSI 001.01.0123456789, IMEI 446019.19.750759.01
- Meas. Control: Repetition Continuous, Stop Condition None, Display Mode Current, Statistic Count 100 Bursts
- Analyzer Level: RF Mode Auto, RF Attenuation Low Noise, Trigger Source Signalling
- MS Signal: Circuit Switched Timing Advance 0 Sym., Single Slot PCL (MS) 10 (23.0 dBm), Timeslot 3

3.4 Overview

- 当在上图中按下P/T Norm. GSMK按键，即可进入右图界面。



有**RUN | HLT | OFF**三种状态. 可以通过**ON/OFF** 或 **CONT/HALT**改变。

对应的HOTKEY同2.2节说明。



Ch. 1	Ch. 2	GSM900 Overview	Circuit Switched Single Slot	Connect Control
RUN P/t Norm. GSMK		10(23.0 dBm) Reported Power	10(23.0 dBm)	Connect Control
		21.4 dBm Avg. Burst Power (Current)	21.4 dBm	
		21.5 dBm Peak Burst Power	21.5 dBm	
		Ok Power Ramp	Ok	
		0.00 Sym. Timing Advance Error	0.00 Sym.	P/t Norm. GSMK
RUN Ext. Phase Error GSMK		12 Hz Frequency Error	12 Hz	
		7.4 ° Peak Phase Error (Current)	7.4 °	
		2.4 ° RMS Phase Error	2.4 °	Application
MS Receiver Reports		48 (- 63 to -62 dBm) RX Level	48	Analyzer Level
		0 (0.0 to 0.2 %) RX Quality	0	MS Signal
		Off Discontinuous Transmission (DTX)	Off	BS Signal
Setup		Signalling States	Signalling States	Menus
		MS Capabilities	MS Capabilities	
		Signaling Info	Signaling Info	
		IMSI	IMSI	
		IMEI	446019.19.750759.0	
		Dialled Number	Emergency call	
		Traffic Mode	Full Rate Version 1	
		Meas. Control	Meas. Control	
		Repetition	Continuous	
		Stop Condition	None	
		Display Mode	Current	
		Statistic Count	100 Bursts	
		Analyzer Level	Analyzer Level	
		RF Mode	Auto	
		RF Attenuation	Low Noise	
		Trigger Source	Signalling	
		MS Signal	MS Signal	
		Circuit Switched	Circuit Switched	
		Timing Advance	0 Sym.	
		Single Slot	Single Slot	
		PCL (MS)	10 (23.0 dBm)	
		Timeslot	3	
Repetition		Stop Condition	Display Mode	Statistic Count

3.4 Overview

■ APPLICATION

Appli-
cation

三种应用选择
HOTKEY

The screenshot displays the 'GSM900 Overview' interface. At the top, it shows 'Ch. 1' and 'Ch. 2' with a blue header bar containing 'GSM900 Overview', 'Circuit Switched Single Slot', and 'Connect Control' buttons. The main area is divided into several sections:

- Measurement Section:** Shows 'RUN P/t Norm. GSMK' with values: 10(23.0 dBm) Reported Power, 21.4 dBm Avg. Burst Power (Current), 21.5 dBm Peak Burst Power, Ok Power Ramp, and 0.00 Sym. Timing Advance Error.
- Ext. Phase Error GSMK Section:** Shows 'RUN Ext. Phase Error GSMK' with values: -2 Hz Frequency Error, -7.0 ° Peak Phase Error (Current), and 2.5 ° RMS.
- MS Receiver Reports Section:** Shows '48 (-63 to -62 dBm) RX Level', '0 (0.0 to 0.2 %) RX Quality', and 'Off Discontinuous Transmission (DTX)'.
- Setup Section:** A tree view showing 'Signalling States', 'MS Capabilities', 'Signalling Info' (IMSI: 446019.19.750759.0, Dialed Number: Emergency call, Traffic Mode: Full Rate Version 1), 'Meas. Control' (Repetition: Continuous, Stop Condition: None, Display Mode: Current, Statistic Count: 100 Bursts), 'Analyzer Level' (RF Mode: Auto, RF Attenuation: Low Noise, Trigger Source: Signalling), 'MS Signal' (Circuit Switched: Timing Advance: 0 Sym.), and 'Single Slot' (PCL (MS): 10 (23.0 dBm), Timeslot: 3).

On the right side, there is a vertical stack of buttons: 'RUN P/t Norm. GSMK', 'Appli-
cation', 'Analyzer Level', 'MS Signal', 'BS Signal', and 'Menus'.

3.4 Overview

Analyzer Level

Analyzer Level

HOTKEY说明同2.2节

The screenshot displays the 'GSM900 Overview' interface. It features a top status bar with 'Ch. 1' and 'Ch. 2' indicators, a 'Circuit Switched Single Slot' status, and a 'Connect Control' button. The main display area is divided into several sections:

- Measurement Data:** Shows 'P/t Norm. GMSK' with values: 10(23.0 dBm) Reported Power, 21.4 dBm Avg. Burst Power (Current), 21.5 dBm Peak Burst Power, Ok Power Ramp, and 0.00 Sym. Timing Advance Error.
- Ext. Phase Error GMSK:** Shows 3 Hz Frequency Error, 6.4 ° Peak Phase Error (Current), and 2.3 ° RMS.
- MS Receiver Reports:** Shows 48 (- 63 to -62 dBm) RX Level, 0 (0.0 to 0.2 %) RX Quality, and Off Discontinuous Transmission (DTX).
- Setup Panel:** A tree view on the right side of the main display showing expandable sections like Signalling States, MS Capabilities, Signaling Info, Meas. Control, Analyzer Level, MS Signal, and Circuit Switched.
- Bottom Bar:** Contains buttons for 'RF Max. Level', 'RF Mode', 'RF Attenuation', 'Trigger Source', and 'Trigger Level'.
- Right Side Panel:** Includes buttons for 'Connect Control', 'P/t Norm. GMSK', 'Application', 'Analyzer Level', 'MS Signal', 'BS Signal', and 'Menus'.

3.4 Overview

■ MS SIGNAL

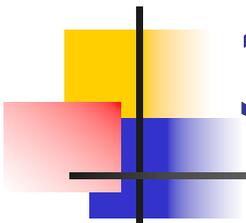
MS Signal

HOTKEY说明
为后节所述:

The screenshot displays the 'GSM900 Overview' interface. The main display area is divided into several sections:

- Reported Power:** 10(23.0 dBm), 21.4 dBm, 21.6 dBm, Ok, 0.00 Sym.
- Ext. Phase Error GMSK:** 9 Hz, -6.5°, 2.1°.
- MS Receiver Reports:** 48 (-63 to -62 dBm) RX Level, 0 (0.0 to 0.2 %) RX Quality, Off Discontinuous Transmission (DTX).
- Setup Menu:** Signalling States, MS Capabilities, Signaling Info (IMSI, IMEI, Dialed Number, Traffic Mode), Meas. Control (Repetition, Stop Condition, Display Mode, Statistic Count), Analyzer Level (RF Mode, RF Attenuation, Trigger Source), MS Signal (Circuit Switched, Timing Advance), Single Slot (PCL (MS), Timeslot).

On the right side, there are control buttons: Connect Control, P/t Norm. GMSK, Application, Analyzer Level, MS Signal, BS Signal, and Menus. At the bottom, there are navigation buttons: PCL, Channel, Timeslot, Timing Advance, Traffic Mode, Bit Stream.



3.4 Overview

- MS SIGNAL 设置

PCL

移动台发射功率等级。

Channel

CMU跟移动台之间通信所使用的信道。

Timeslot

CMU跟移动台之间通信所使用的时隙。

Timing
Advance

移动台发射的时间提前量。

Traffic
Mode

业务信道的传输模式。

Bit
Stream

设置业务信道的比特流。

3.4 Overview

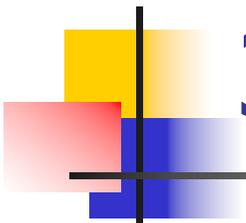
■ BS SIGNAL

BS Signal

The screenshot displays the 'GSM900 Overview' interface. The top bar shows 'Ch. 1' and 'Ch. 2' on the left, and 'GSM900 Overview' in the center. On the right of the top bar are 'Circuit Switched Single Slot', navigation icons, and a 'Connect Control' button. The main area is divided into several sections:

- Left Panel (Parameters):**
 - RUN P/t Norm. GMSK:**
 - 10(23.0 dBm) Reported Power
 - 21.5 dBm Avg. Burst Power (Current)
 - 21.6 dBm Peak Burst Power
 - Ok Power Ramp
 - 0.00 Sym. Timing Advance Error
 - RUN Ext. Phase Error GMSK:**
 - 5 Hz Frequency Error
 - 8.3 ° Peak Phase Error (Current)
 - 2.1 ° RMS
 - MS Receiver Reports:**
 - 49 (-62 to -61 dBm) RX Level
 - 0 (0.0 to 0.2 %) RX Quality
 - Off Discontinuous Transmission (DTX)
- Right Panel (Setup):**
 - Signalling States
 - MS Capabilities
 - Signaling Info: IMSI (446019.19.750759.0), Dialed Number (Emergency call), Traffic Mode (Full Rate Version 1)
 - Meas. Control: Repetition (Continuous), Stop Condition (None), Display Mode (Current), Statistic Count (100 Bursts)
 - Analyzer Level: RF Mode (Auto), RF Attenuation (Low Noise), Trigger Source (Signalling)
 - MS Signal: Circuit Switched (Timing Advance: 0 Sym.), Single Slot (PCL (MS): 10 (23.0 dBm), Timeslot: 3)
- Bottom Panel:** TCH Level, Hopping, and a Menu button.

HOTKEY说明
为后节所述:



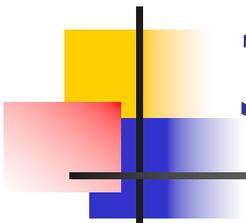
3.4 Overview

- BS SIGNAL 设置

TCH Level 定义CMU传输信道在所使用的时隙的功率。

Hopping

跳频图案选择。

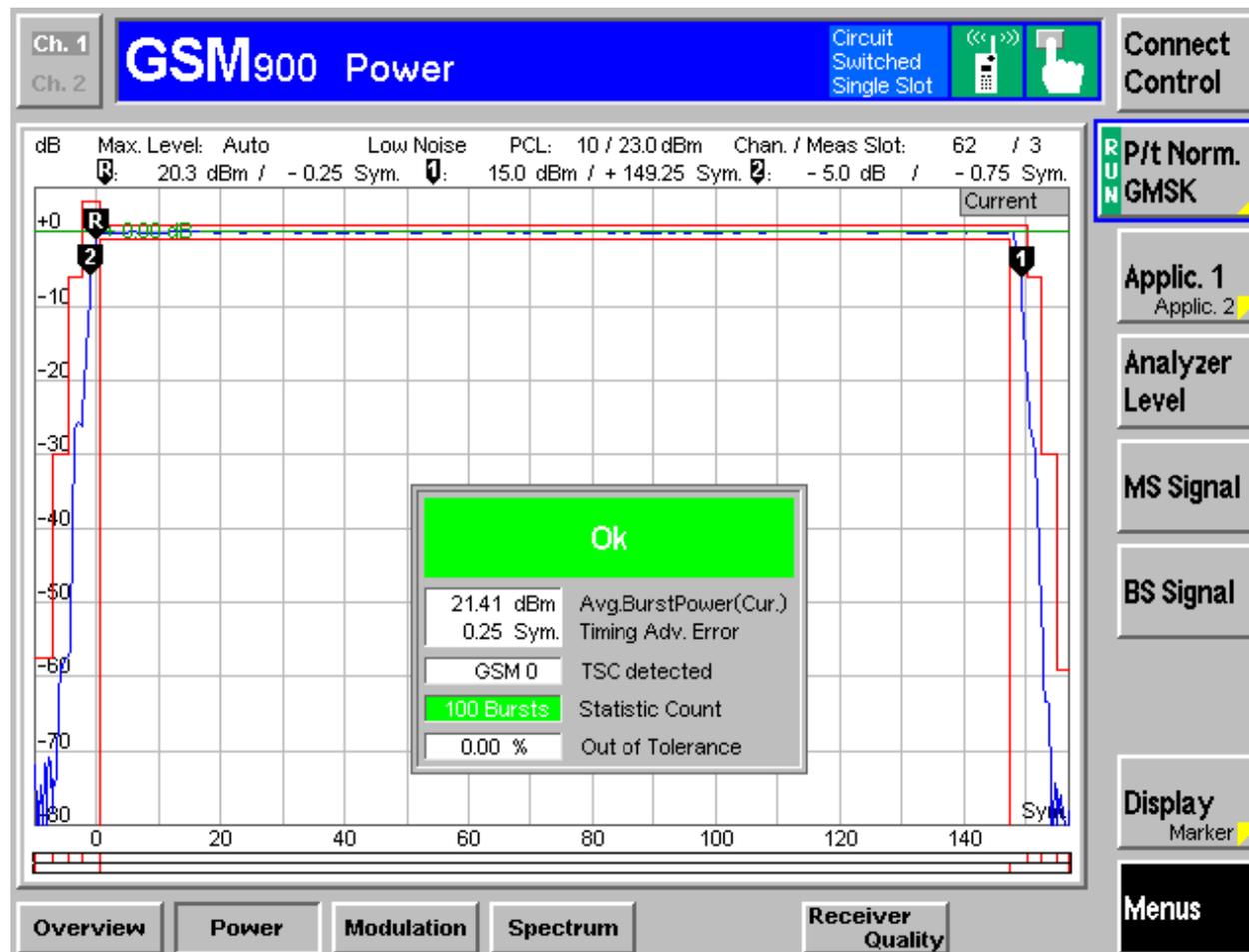


3.5 Power Measurements

- 测量MS发射机的射频输出功率。
- 主要的测试应用有：P/t Normal SMSK, P/t Normal 8PSK、P/t Multislot、P/Frame、P/Slot Graph、P/Slot Table、P/PCL和P/t Access Burst。
- 选择信令模式Singalling->Power, 即可进入 Power。或通过Menus菜单的子菜单POWER HOTKEY。
- P/PCL和P/t Access GMSK测量与信令有关。
- 同OVERVIEW相同的设置, 此后不再赘述。

3.5 Power Measurements

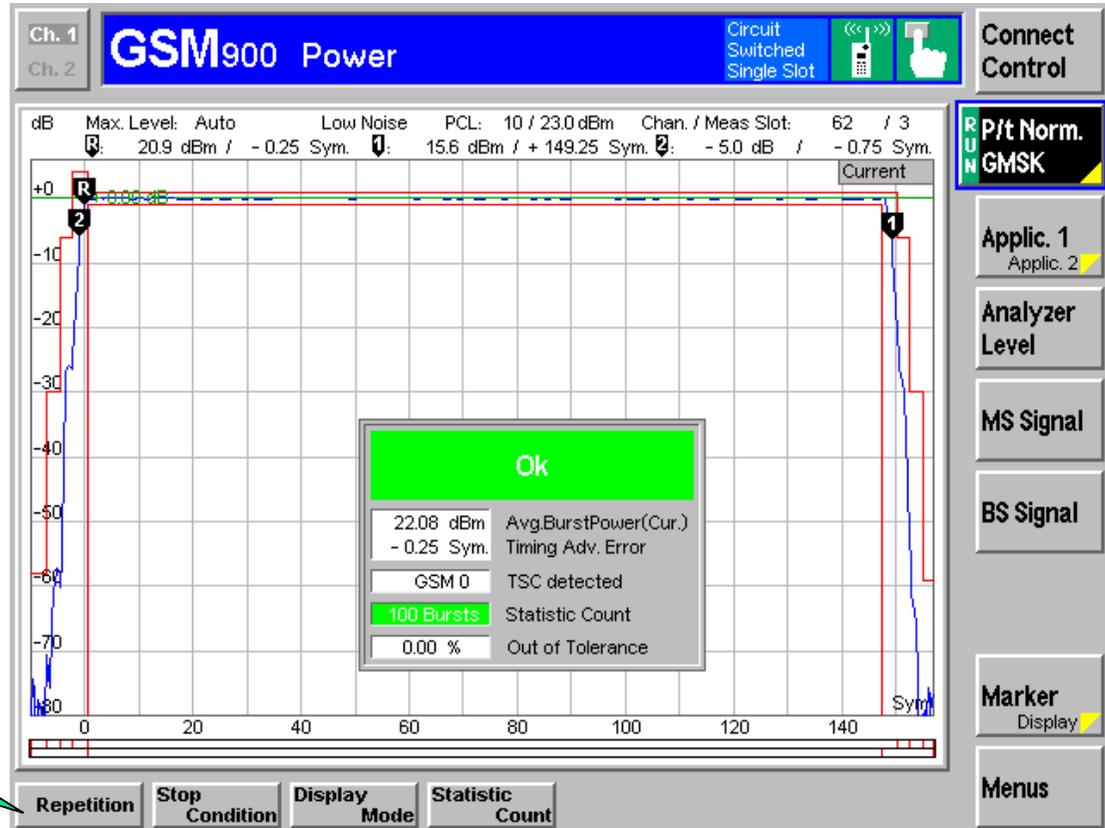
- POWER



3.5 Power Measurements

■ P/t Norm. GMSK

RUN P/t Norm. GMSK



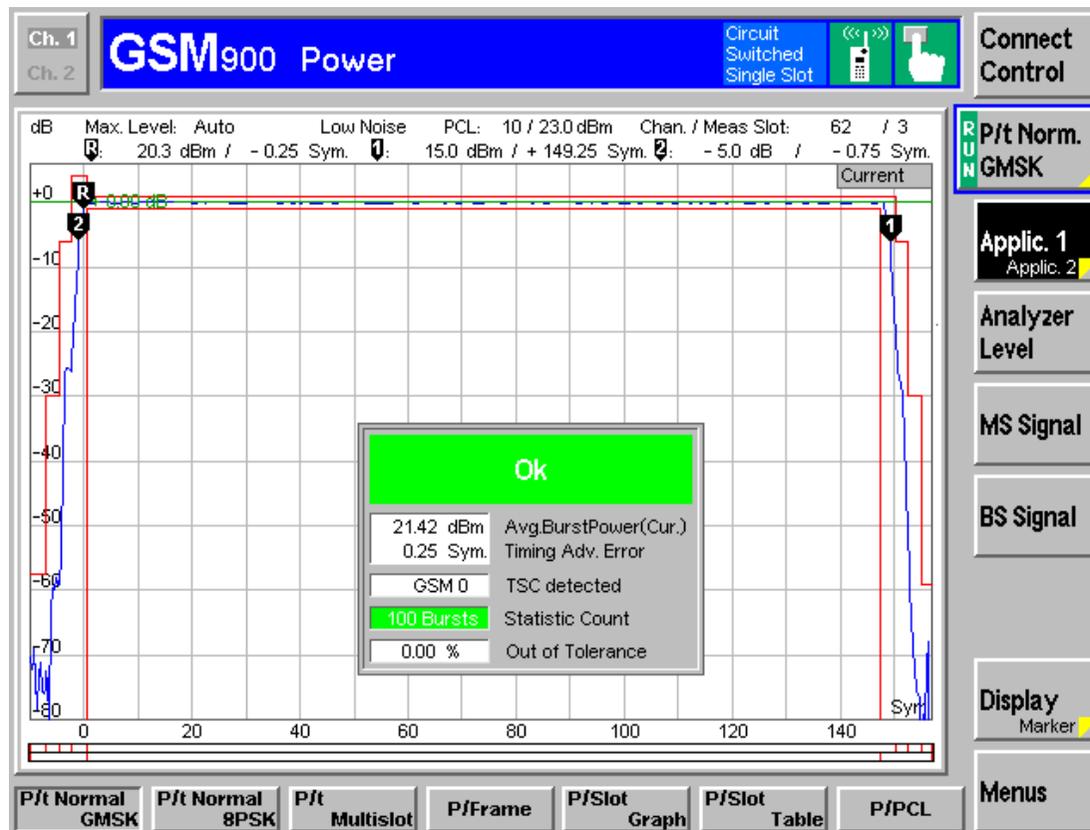
HOTKEY
同前述

3.5 Power Measurements

APPLICATION

Applic. 1
Applic. 2

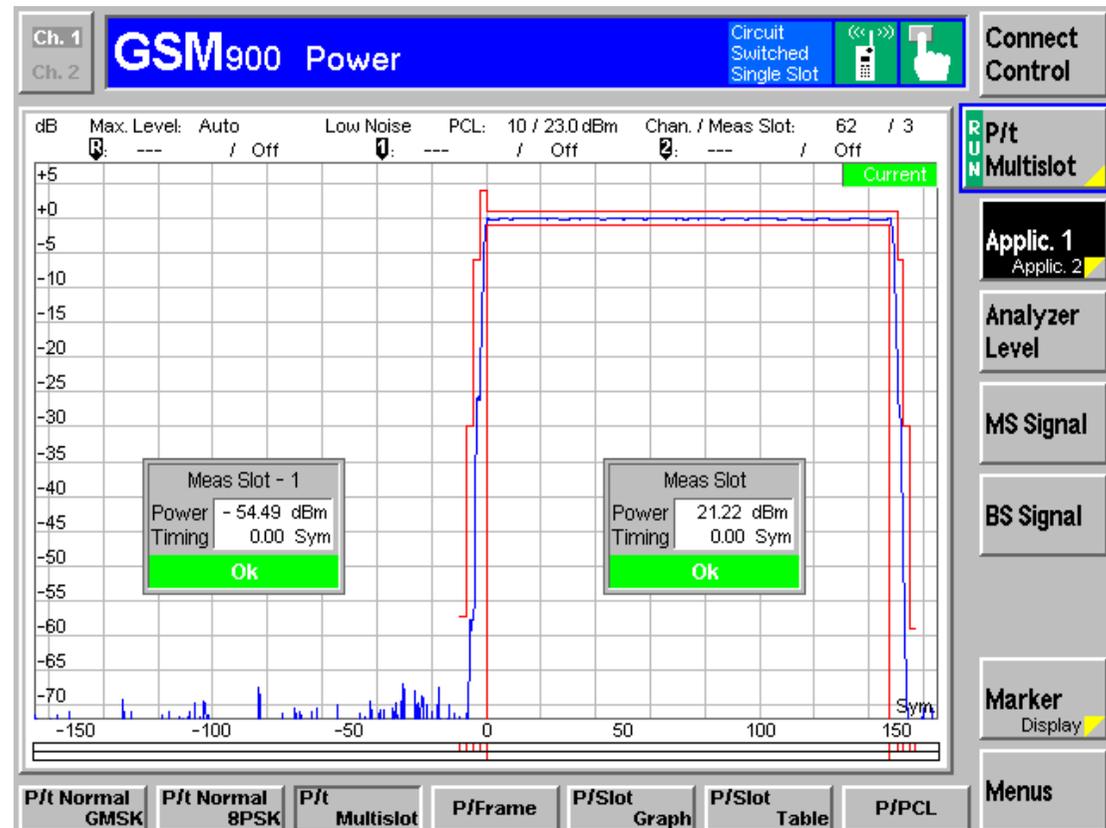
测试一个
Normal
Burst中功
率跟时间的
对应关系



3.5 Power Measurements

- P/t Multislot 测量连续多个时隙的功率跟时间的对应关系

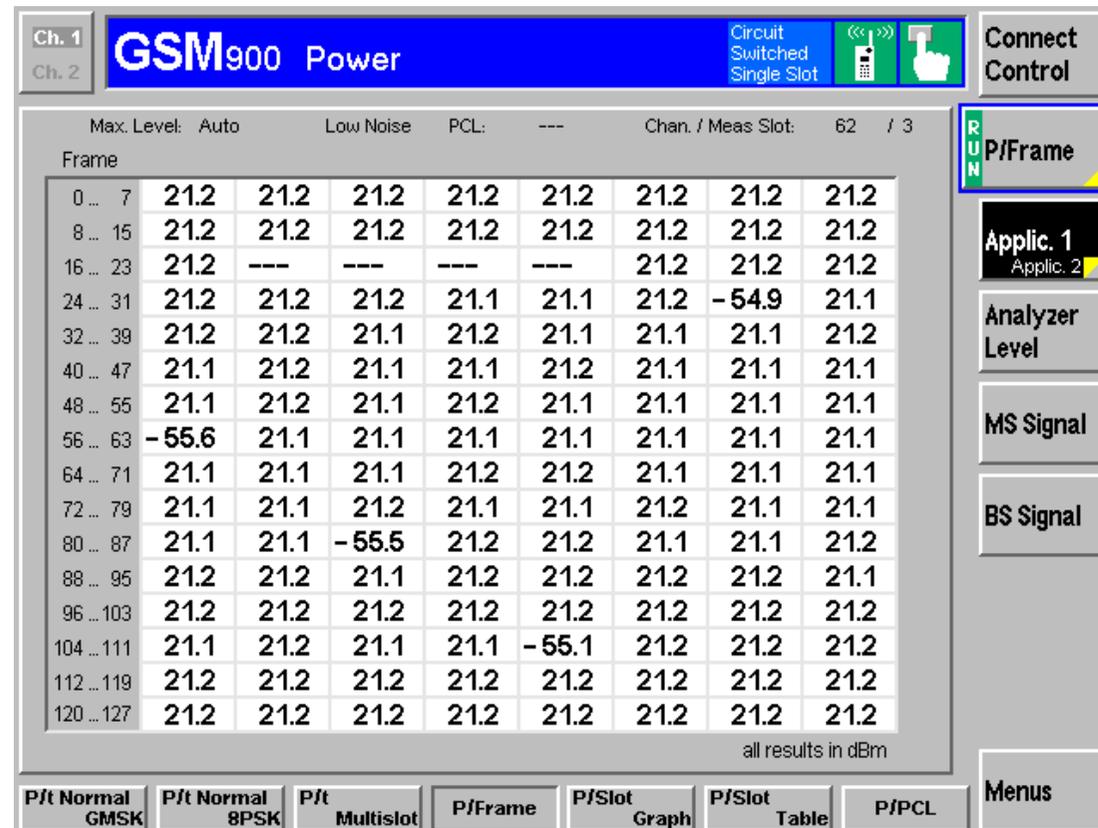
P/t
Multislot



3.5 Power Measurements

- P/Frame测试帧中有用时隙的平均功率。

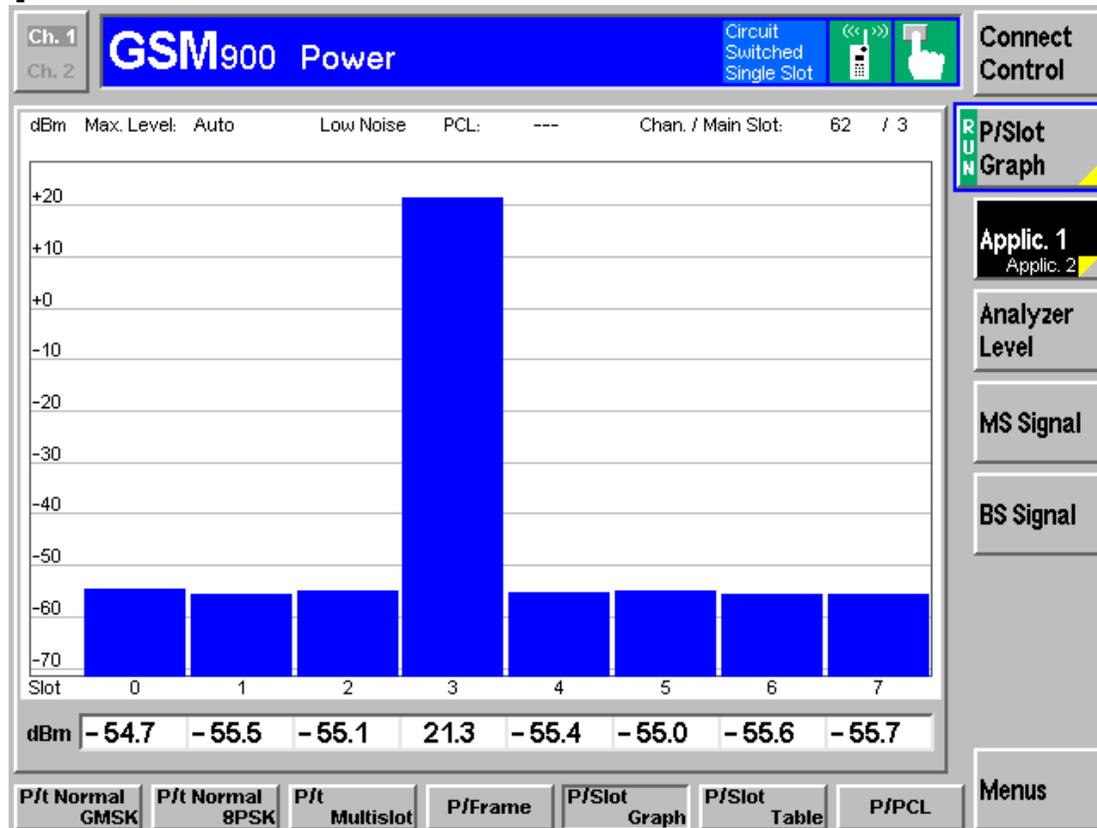
P/Frame



3.5 Power Measurements

- P/Slot Graph 帧里各个时隙所对应的功率柱状图。

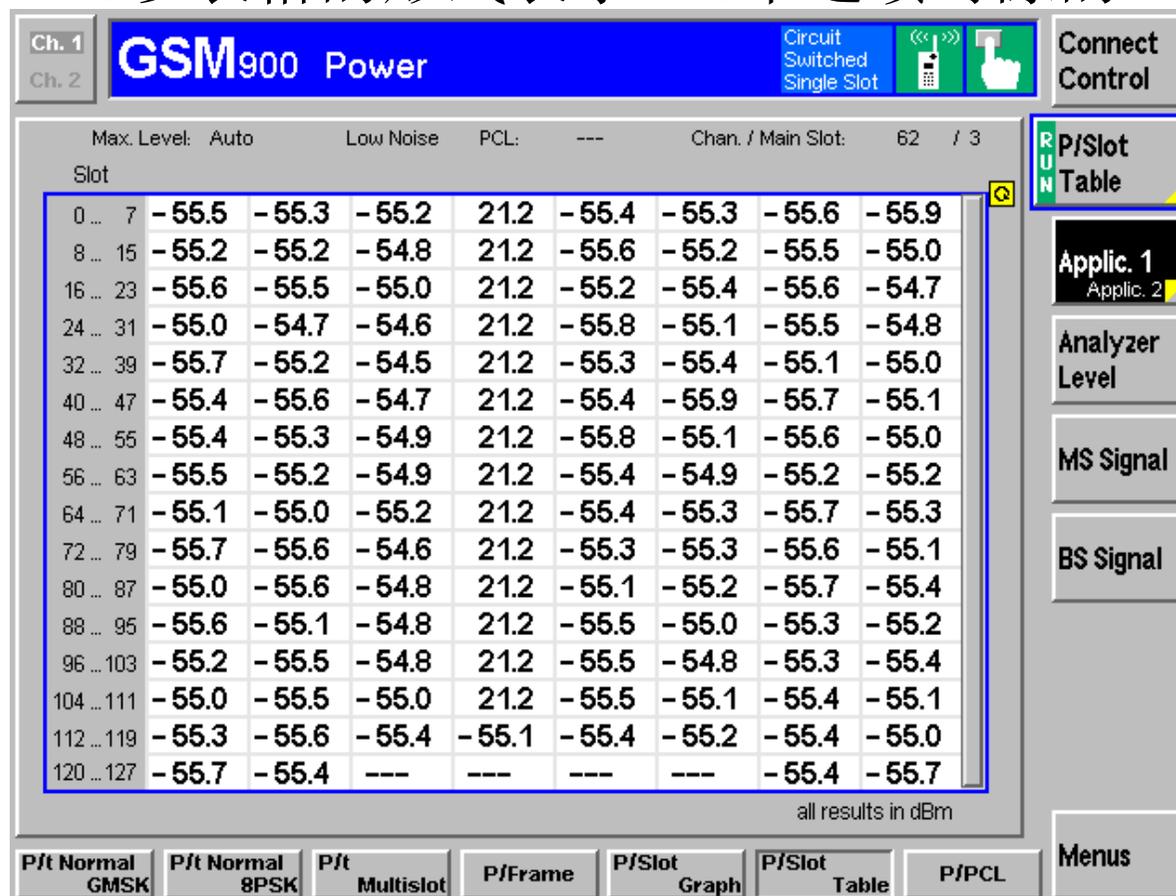
P/Slot
Graph



3.5 Power Measurements

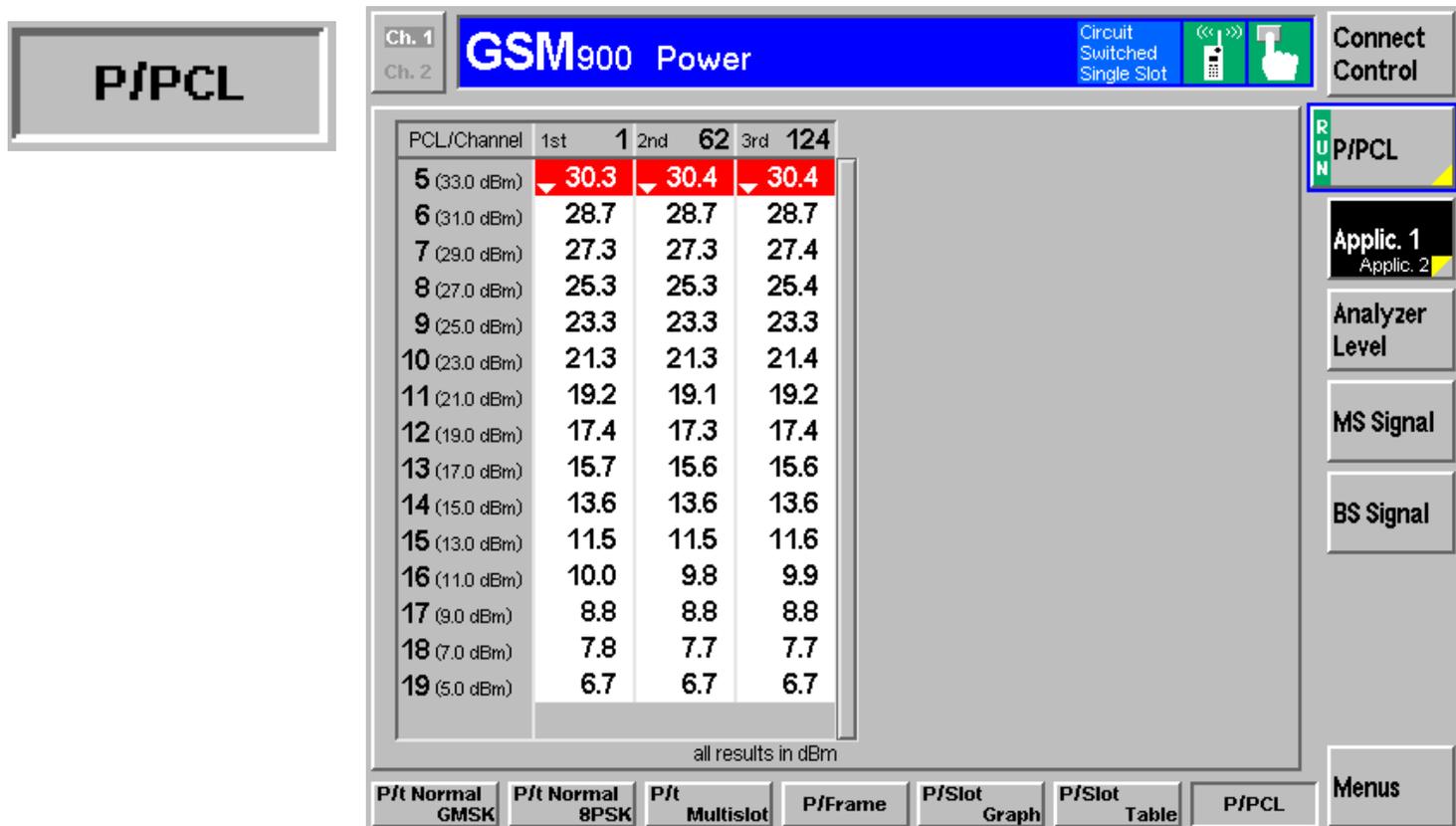
- P/Slot Table以表格的形式表示128个连续时隙的平均功率

P/Slot
Table



3.5 Power Measurements

- P/PCL 每一功率等级下的高、中、低信道的功率。

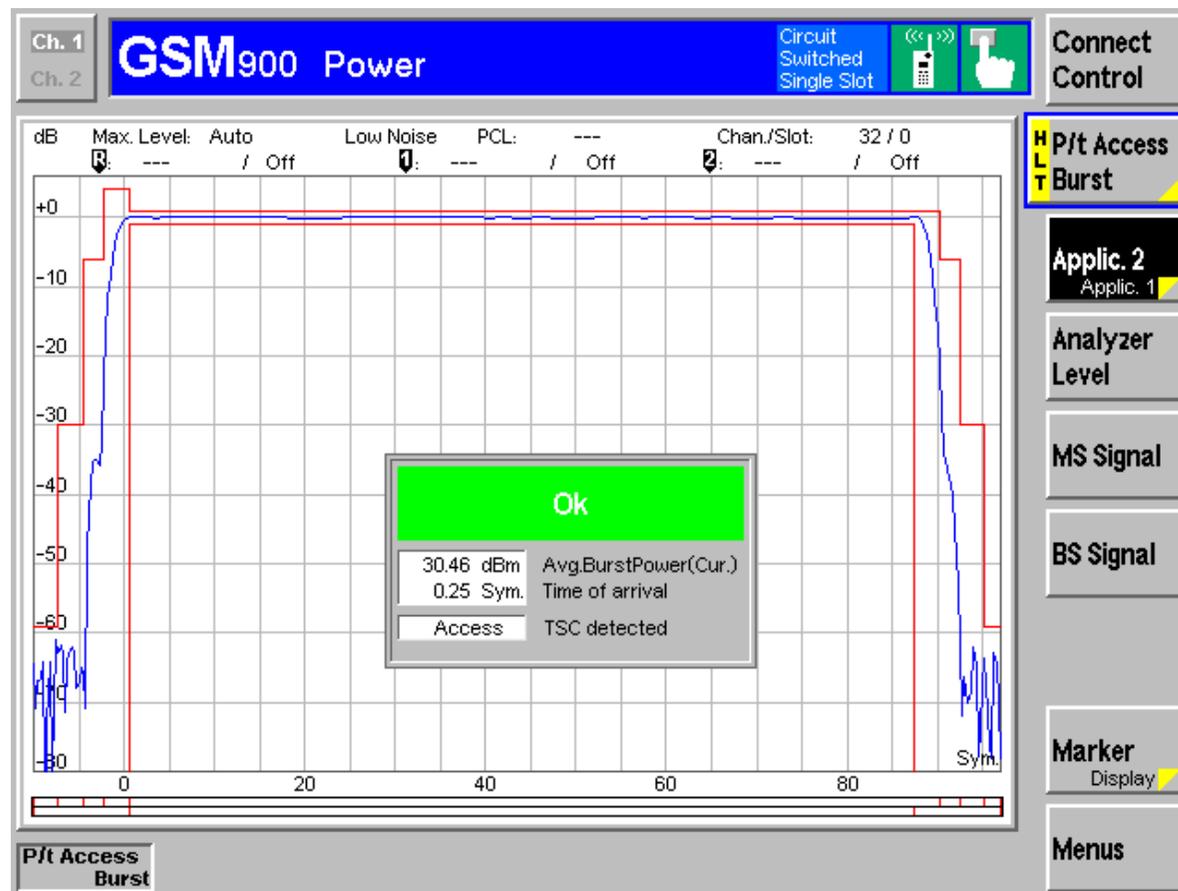


3.5 Power Measurements

- P/t Access Burst接入突发的功率VS时间曲线

P/t Access
Burst

P/t Access Burst
测试的时候一定要注意，不是什
么时候都能捕捉到的。Access
Burst是接入突发，
只在移动台向
CMU要求接入
的那一刻存在。

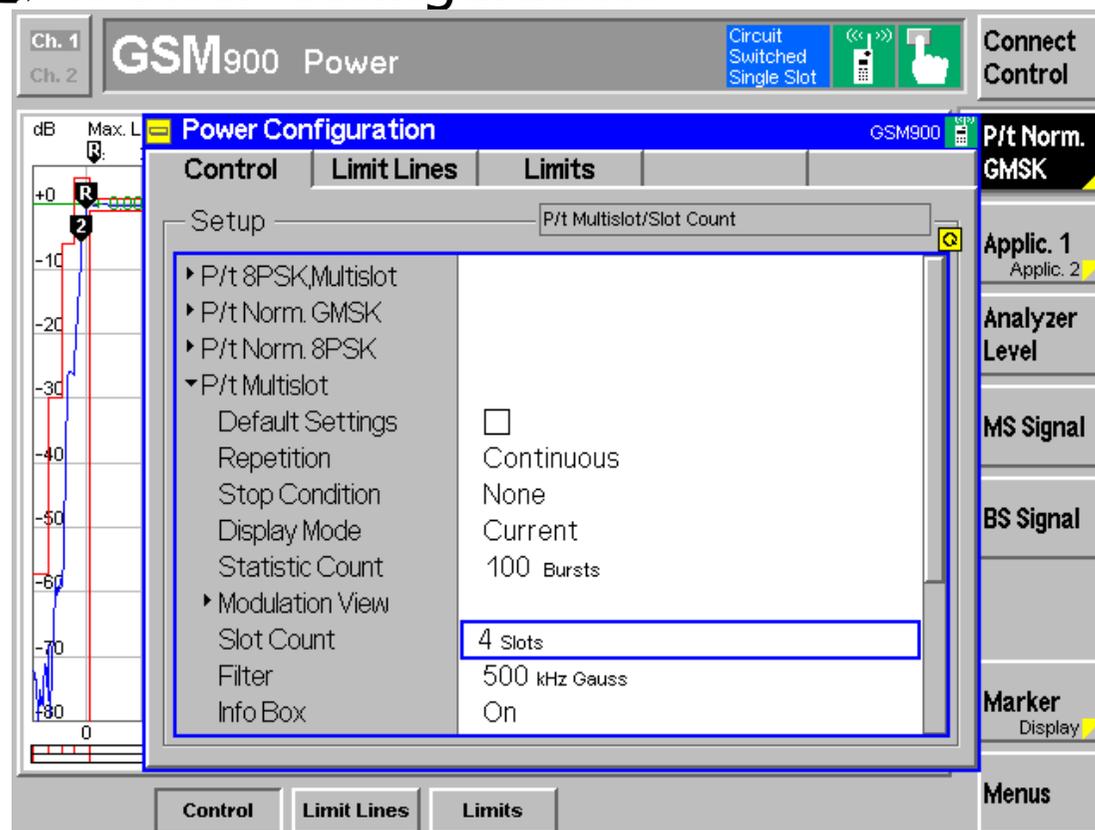


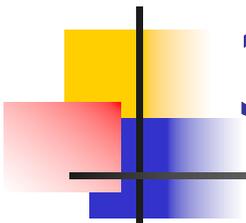
3.5 Power Measurements

- Power Configuration连续2次按P/t Norm GMSK软键，进入Power Configuration



Power Configuration
主要由3个部分构成：
Control、Limit Lines
和Limits。





3.5 Power Measurements

■ Power Configuration

Control

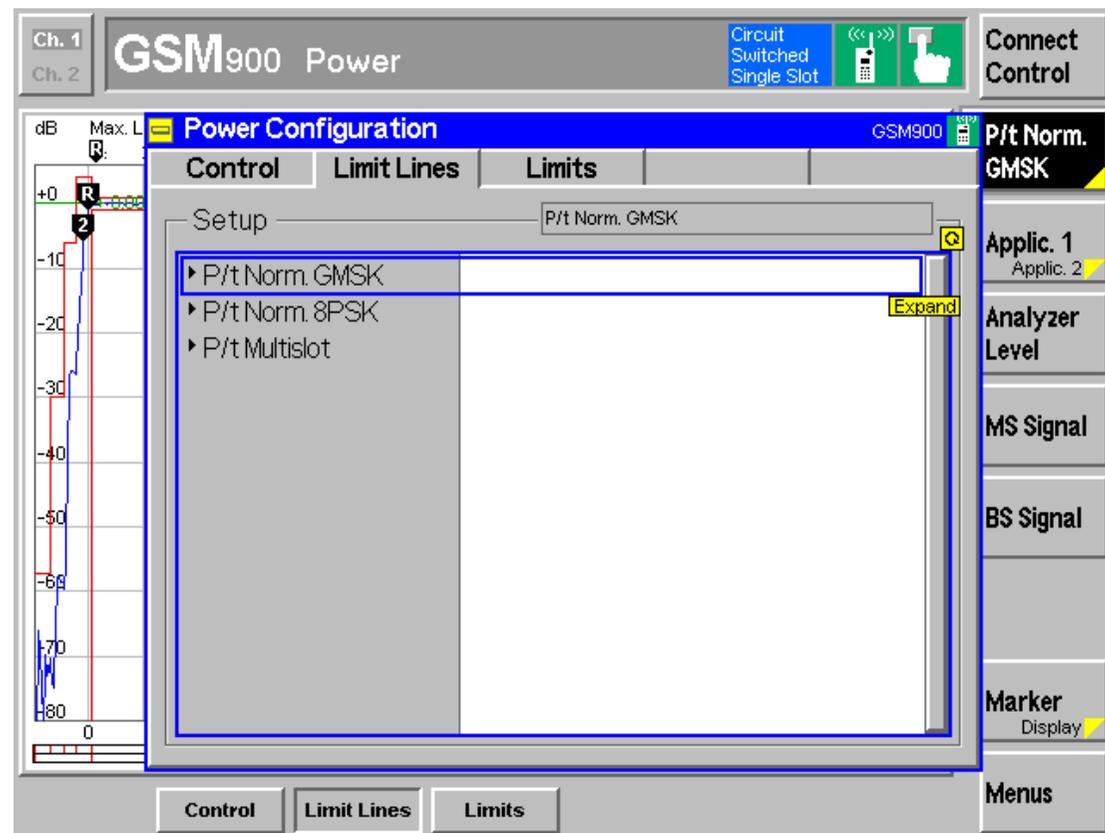
在Control下拉菜单中，又包含P/t 8PSK.Multislots、P/t Norm.GSMK、P/t Norm.8PSK、P/t Multislots、P/Frame、P/Slot Graph、P/Slot Table、P/PCL以及P/t Access Burst等8个功率测试相关内容的设置，以上8个配置项目又有各自的菜单。

3.5 Power Measurements

■ Power Configuration_Limit Lines

Limit Lines

Limit Lines主要跟功率VS时间模板有关，P/t Norm.GSMK、P/t Norm.8PSK和P/t Multislot，在这个配置项里面，对功率VS时间模板有严格的定义。



3.5 Power Measurements

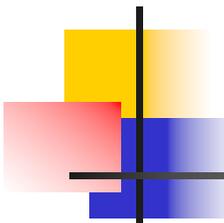
■ Power Configuration_Limits

Limits

在Limits里面，对移动台的各级功率的范围有严格说明，CMU通过这里的设置来确认被测的移动台功率指标是否符合要求。

The screenshot shows the 'Power Configuration' dialog box with the 'Limits' tab selected. The 'Limits' sub-tab is active, displaying a table of power limits for 10 different ranges. The 'Limits' sub-tab is active, displaying a table of power limits for 10 different ranges. The 'Limits' sub-tab is active, displaying a table of power limits for 10 different ranges.

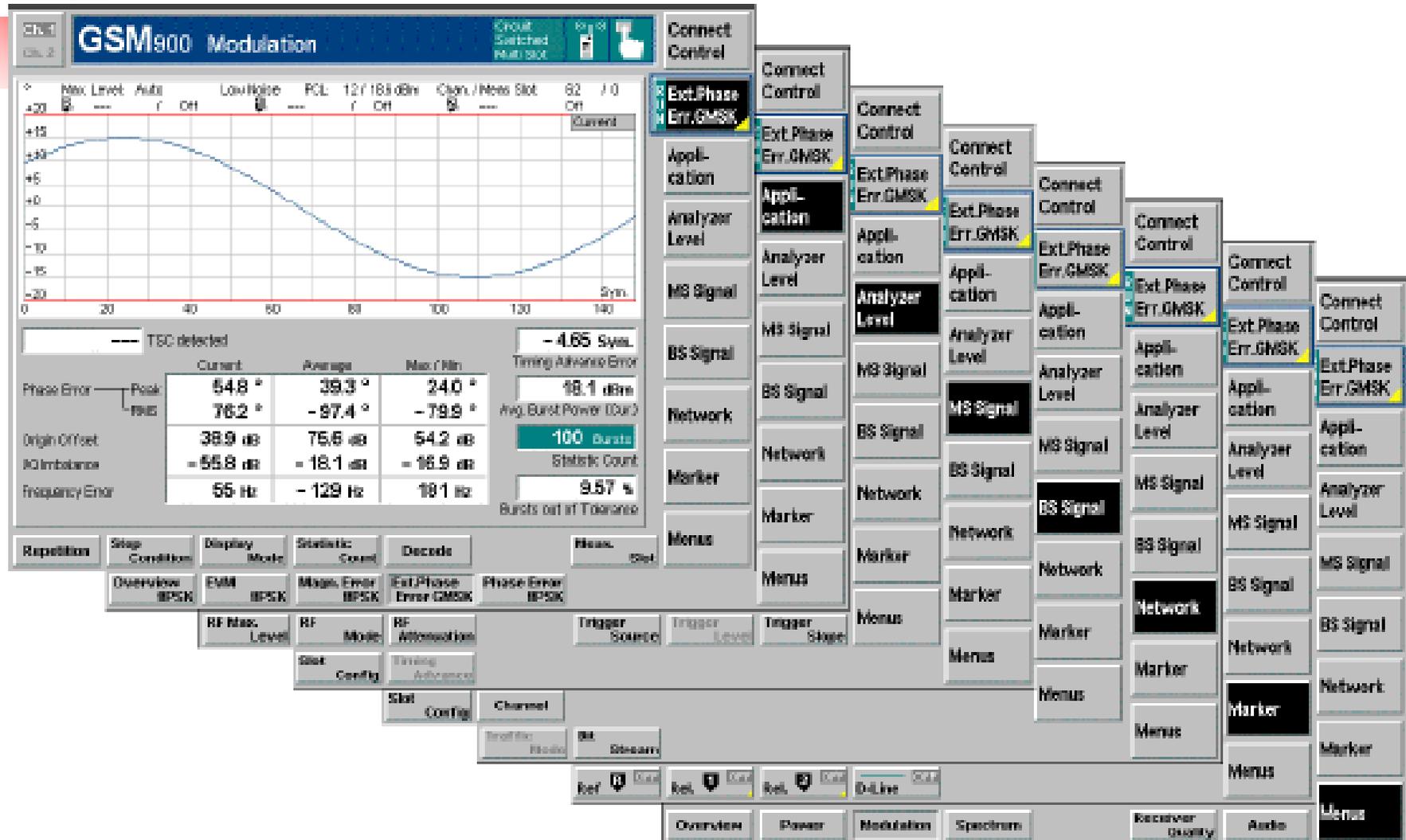
Range	PCL	from...to	Lower	Upper	Enable
1	MAX	MAX	-2.0 dB	+2.0 dB	<input type="checkbox"/>
2	0	2	-2.0 dB	+2.0 dB	<input checked="" type="checkbox"/>
3	3	15	-3.0 dB	+3.0 dB	<input checked="" type="checkbox"/>
4	16	31	-5.0 dB	+5.0 dB	<input checked="" type="checkbox"/>
5	Off	Off	Off	Off	<input type="checkbox"/>
6	Off	Off	Off	Off	<input type="checkbox"/>
7	Off	Off	Off	Off	<input type="checkbox"/>
8	Off	Off	Off	Off	<input type="checkbox"/>
9	Off	Off	Off	Off	<input type="checkbox"/>
10	Off	Off	Off	Off	<input type="checkbox"/>



3.6 Modulation Measurements

- 调制测量就是对**MS**发射的参数进行测量。
- 主要通过峰值相位误差、均方根相位误差、频率误差等参数体现出来。
- 后图为**Modulation**的组合图。

3.6 Modulation Measurements



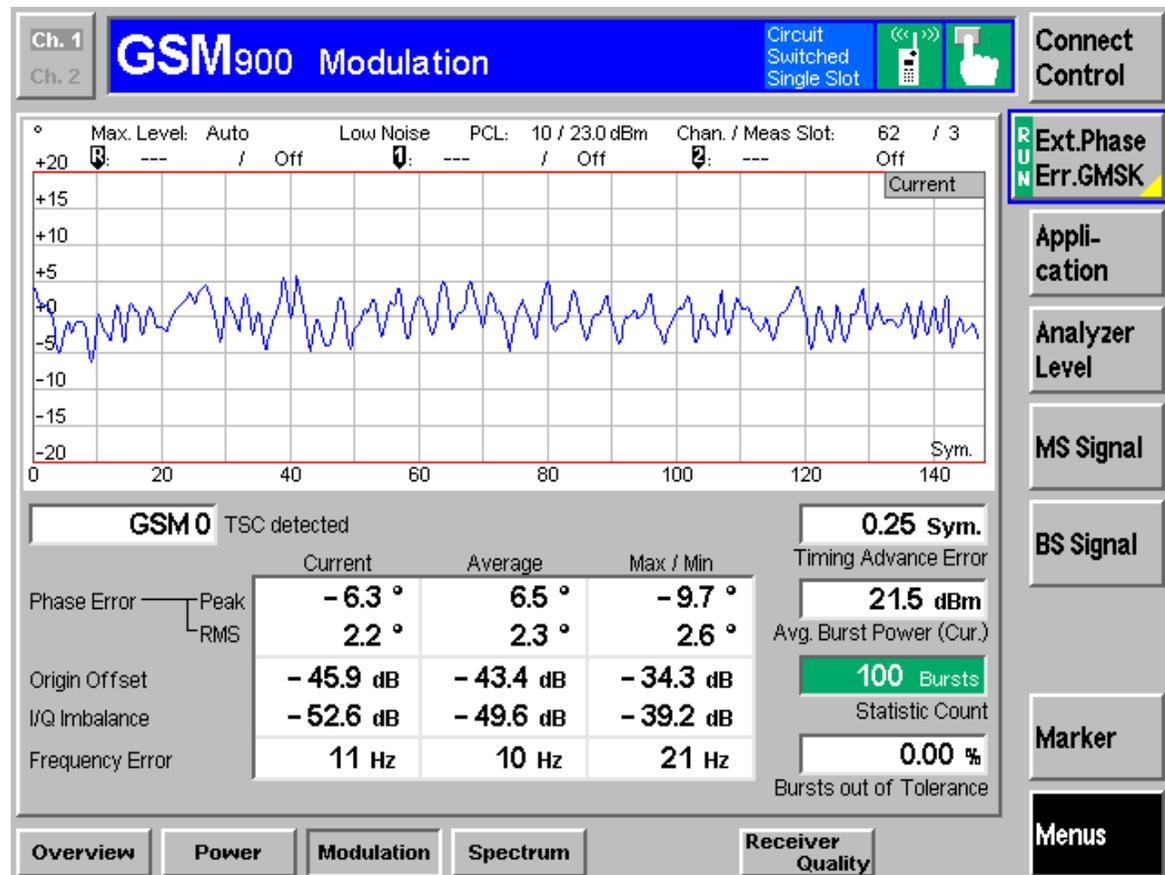
3.6 Modulation Measurements

- 选择信令模式 Singalling; Modulation，即可进入 GSM900

Modulation。

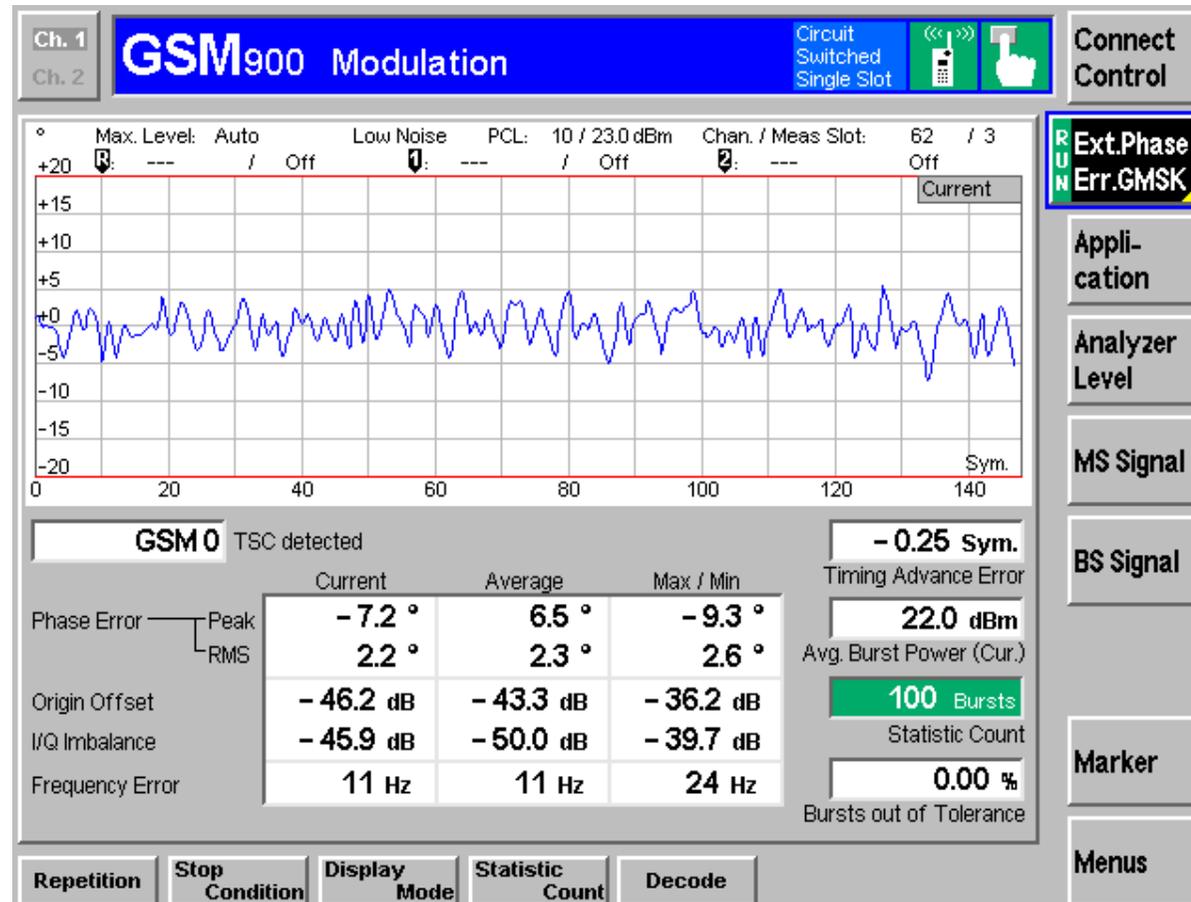
主要测试移动台发射信号时的调制质量；通过峰值相位误差、均方根相位误差、频率误差等参数体现出来。

Origin Offset和 I/Q Imbalance 参数反应 I/Q 调制的精度。



3.6 Modulation Measurements

- Ext.Phase Err.GSMK



3.6 Modulation Measurements

- Modulation Configuration_Control

The screenshot displays a software interface for GSM900 Modulation measurements. The main window is titled "GSM900 Modulation" and includes a "Connect Control" button. A "Modulation Configuration" window is open, showing a tree view of measurement options under the "Setup" tab. The tree view includes:

- Ovw,EVM,ME,PE 8PSK
- Overview 8PSK
- EVM 8PSK
- Magnitude Error 8PSK
- Ext. Phase Error GMSK
- Phase Error 8PSK

An "Expand" button is visible next to the tree view. The interface also features a "Control" tab, a "Limits" tab, and a "Menus" button. A graph on the left shows a signal waveform with a y-axis ranging from -20 to +20. The graph is labeled "Phase Error" and "Origin Offset".

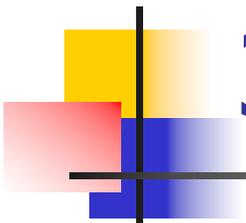
3.6 Modulation Measurements

■ Modulation Configuration_Limits

The screenshot displays a software interface for GSM900 Modulation measurements. The main window is titled "GSM900 Modulation" and includes a "Connect Control" button. The "Modulation Configuration" window is open, showing the "Limits" tab. The "Limits" tab is divided into "Control" and "Limits" sections. The "Limits" section is further divided into "Setup" and "Ext. Phase Error GMSK/Current & Max." sections. The "Setup" section includes a table of measurement parameters and their limits.

Measurement	Limit
Phase Err. Peak	+ 20.0 °
Phase Err. RMS	+ 5.0 °
Origin Offset	- 20.0 dB
I/Q Imbalance	- 20.0 dB
Frequency Error	+ 90 Hz

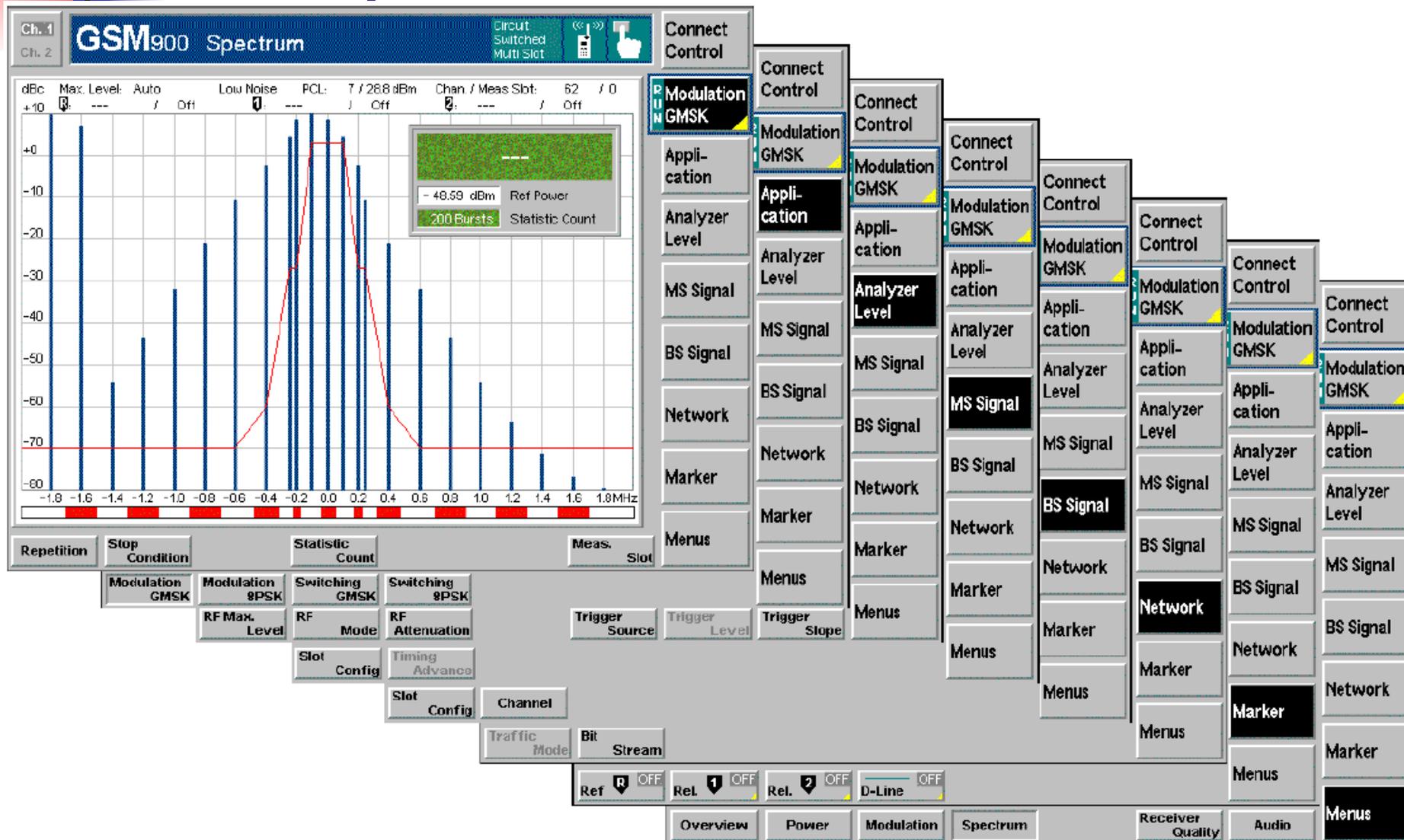
The interface also features a graph on the left showing a signal waveform, and a vertical toolbar on the right with buttons for "Application", "Analyzer Level", "MS Signal", "BS Signal", "Marker", and "Menus".



3.7 Spectrum Measurements

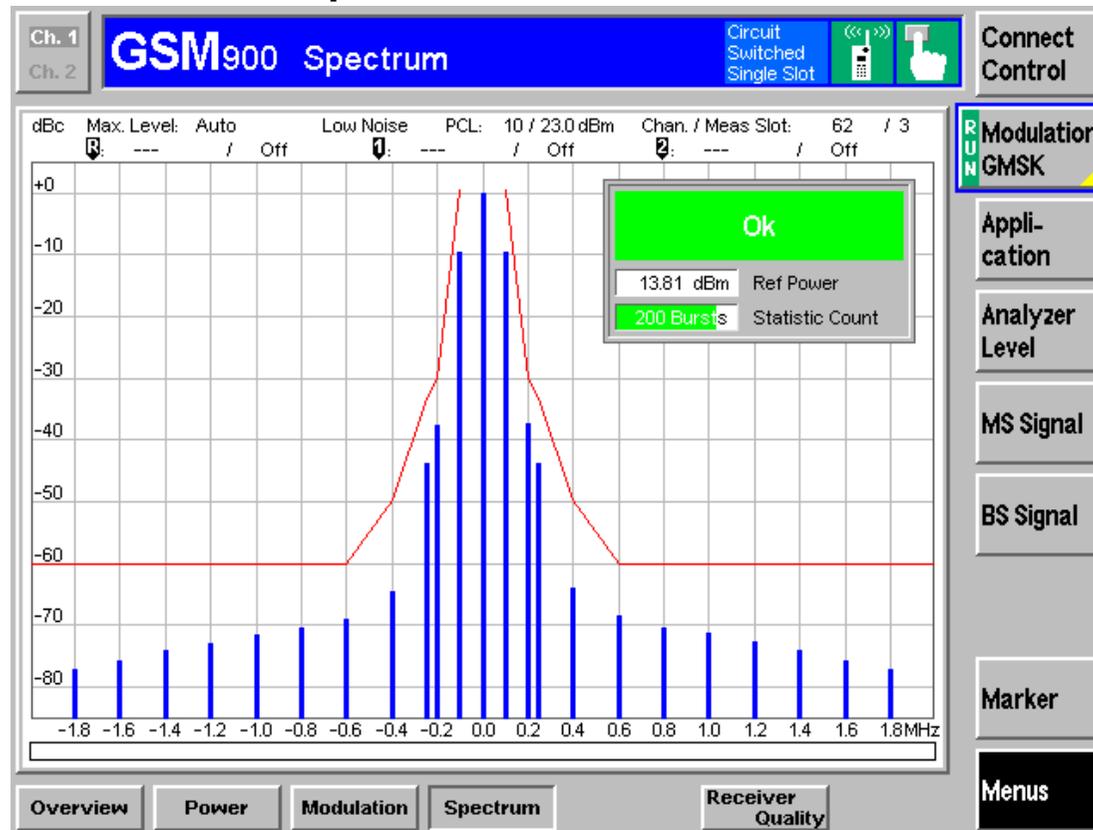
- MS spectrum 主要分为: Modulation spectrum, switching spectrum.
- 选择信令模式 Singalling->Spectrum, 即可进入 Spectrum。
- 包含有: Modulation GSMK , Modulation 8PSK, Switching GMSK, Switching 8PSK.

3.7 Spectrum Measurements



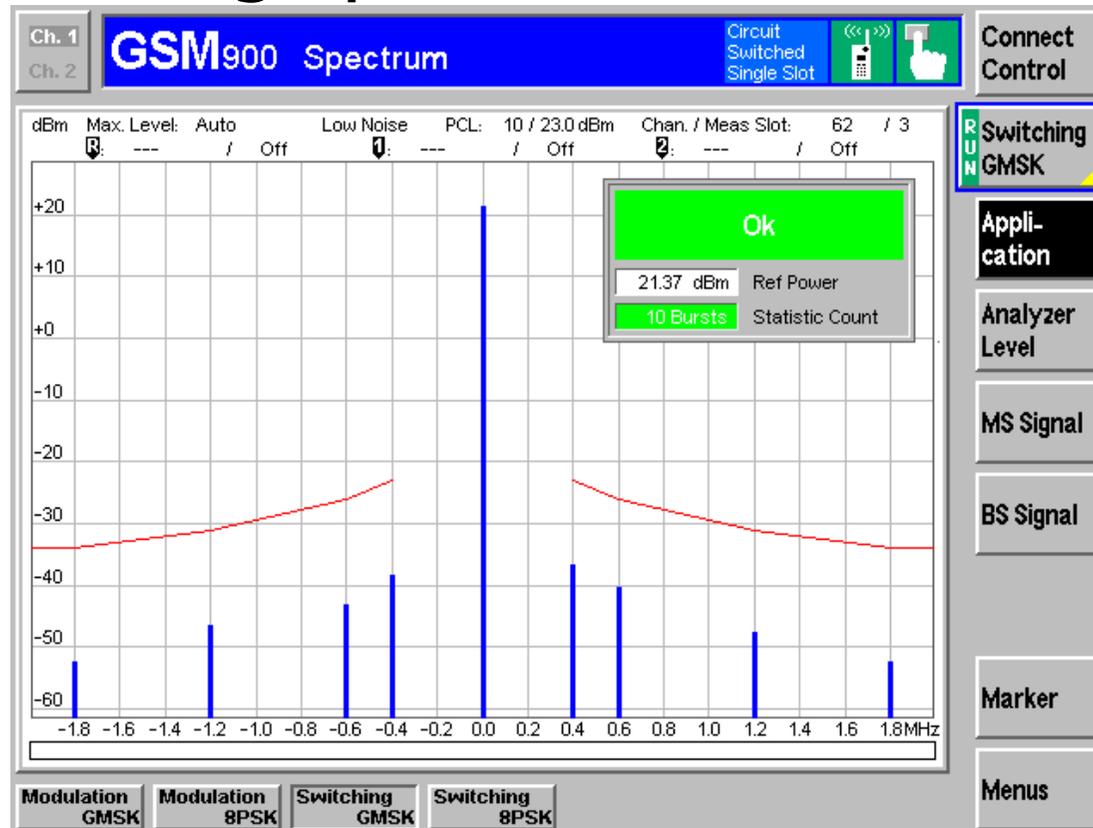
3.7 Spectrum Measurements

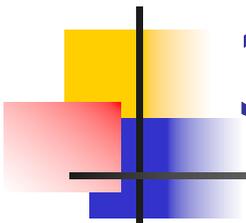
- Modulation Spectrum GSMK



3.7 Spectrum Measurements

- Switching spectrum GSMK





3.8 Receiver Quality Measurements

- 接收质量测试是关于传输路径性能测量。
- 主要有BER、Average BER, Neighbor Cells。
- 选择信令模式Singalling->Receive Quality, 即可进入GSM900 Receive Quality。

3.8 Receiver Quality Measurements

The screenshot displays a software interface for GSM900 Receiver Quality measurements. The main window shows various test parameters and a settings panel. A cascading menu is open, listing measurement levels and signal types.

Main Window Data:

- Ch. 1:** 0.606 (Class I)
- Ch. 2:** 0.000 (Class II)
- Stop Condition:** 100 Speech Frames
- Test Setup:** Test 1, BER
- Traffic:** Full Rate Version 1
- BT Stream:** PRBS 3EQ-1
- Main Slot:** 3, 18 (-93 to -92 dBm) (RX Level), 0 (00 to 0.2 %) (RX Quality)
- Settings:**
 - Signaling Status: NSI 001.01.0000000001, NEI 000000.01.12458.0
 - Called Number: -
 - Traffic Mode: Full Rate Version 1
 - Meas. Control: Stop Condition: 1st Limit exceeded 101
 - Frames: Test Setup: Test 1
 - Meas. Mode: Test 1
 - Analyzer Level: Test 1
 - MS Signal: Test 1
 - BS Signal: Test 1
 - Network: Test 1

Cascading Menu Options:

- Connect Control
- BER
- Application
- Analyzer Level
- MS Signal
- BS Signal
- Network
- Menus

Bottom Panel Buttons:

- BER
- BER Average
- Neighbor Cells
- BLER
- RF Max. Level
- RF Mode
- RF Attenuation
- Trigger Source
- Trigger Level
- Trigger Slope
- Slot Config
- Timing Advance
- TCH Level BER
- Channel
- Traffic Mode
- BT Stream BER
- Overview
- Power
- Modulation
- Spectrum
- Receiver Quality
- Audio
- Menus

3.8 Receiver Quality Measurements

■ BER

The screenshot displays a software interface for GSM900 Receiver Quality measurements. The main window is titled "GSM900 Receiver Quality" and includes a "Connect Control" button. The interface is divided into several sections:

- Class Information:** Shows Class II and Class Ib with dashes indicating no data.
- CRC Errors:** Shows "CRC Err." with dashes.
- Measurement Time:** A bar graph shows "100 Speech Frames" over a "Time" interval from 0.00 s to 2.00 s.
- Test Setup:** A table shows the configuration for "Test 1":

Test Setup	Test 1
Meas. Mode	BER
Traffic	Full Rate Version 1
Bit Stream	PRBS 2E9-1
- Main Slot:** Shows "3 47 (-64 to -63 dBm)" for RX Level and "3 (0.8 to 1.6 %)" for RX Quality.
- Setup Panel:** A tree view shows the following configuration:

Signalling States	
MS Capabilities	
Signalling Info	
IMSI	
IMEI	446019.19.750759.01
Dialled Number	Emergency call
Traffic Mode	Full Rate Version 1
Meas. Control	
Stop Condition	1st Limit exceeded
Frames	100
Test Setup	Test 1
Meas. Mode	BER
Analyzer Level	
RF Max. Level	30.00 dBm
RF Mode	Auto
RF Attenuation	Low Noise
Trigger Source	Signalling
Trigger Level	Low
MS Signal	
BS Signal	
BER Limit Config	
- Right Panel:** Includes a "RUN" button, "Application", "Analyzer Level", "MS Signal", "BS Signal", and "Menus" buttons.
- Bottom Panel:** Includes "BER", "BER Average", "Neighbor Cells", and "Menus" buttons.

3.8 Receiver Quality Measurements

- BER average

The screenshot displays a software interface for GSM900 Receiver Quality measurements. The main display area shows the following data:

0.057 %	Class II
0.000 %	Class Ib
0	CRC Err.

A green progress bar indicates **100 Speech Frames** have been processed.

Measurement parameters are listed below:

Meas. Mode	BER
Traffic	Full Rate Version 1
Bit Stream	PRBS 2E9-1

Main Slot configuration:

3	6 (-105 to -104 dBm)	RX Level
	0 (0.0 to 0.2 %)	RX Quality

The Setup menu is expanded to show the following configuration:

- Signalling States
- MS Capabilities
- Signaling Info
 - IMSI: ----
 - IMEI: 446019.19.750759.0
 - Dialled Number: Emergency call
 - Traffic Mode: Full Rate Version 1
- Meas. Control
 - Stop Condition: None
 - Average: 100 Frames
 - Meas. Mode: BER
- Analyzer Level
 - RF Max. Level: 30.00 dBm
 - RF Mode: Auto
 - RF Attenuation: Low Noise
 - Trigger Source: Signalling
 - Trigger Level: Low
- MS Signal
- BS Signal
- BER Limit Config

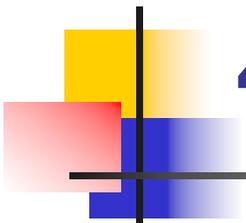
On the right side, there is a vertical control panel with buttons for **Connect Control**, **BER Average** (highlighted with a 'RUN' indicator), **Application**, **Analyzer Level**, **MS Signal**, and **BS Signal**. At the bottom, there is a navigation bar with buttons for **Overview**, **Power**, **Modulation**, **Spectrum**, **Receiver Quality** (selected), and **Menus**.

3.8 Receiver Quality Measurements

- Neighbor Cells

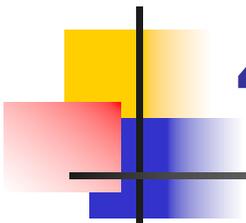
The screenshot displays the 'GSM900 Receiver Quality' software interface. The main window is titled 'GSM900 Receiver Quality' and includes a 'Connect Control' button. The interface is divided into several sections:

- Channel Selection:** 'Ch. 1' and 'Ch. 2' are visible in the top left corner.
- Mode:** 'Circuit Switched Single Slot' is indicated in the top right.
- Neighbor Cells Table:** A table with two columns, 'Channel' and 'RX Level', is shown. The table contains several rows of dashes, indicating no data is currently displayed.
- Navigation Buttons:** A vertical stack of buttons on the right side includes 'Connect Control', 'Neighb. Cells' (highlighted with a blue border), 'Application', 'Analyzer Level', 'MS Signal', and 'BS Signal'.
- Bottom Panel:** A row of buttons at the bottom includes 'BER', 'BER Average', 'Neighbor Cells' (highlighted), and 'Menus'.



4. CMU200 的维护与保养

- 4.1 版本管理
- 4.2 版本更新
- 4.3 硬件操作注意事项



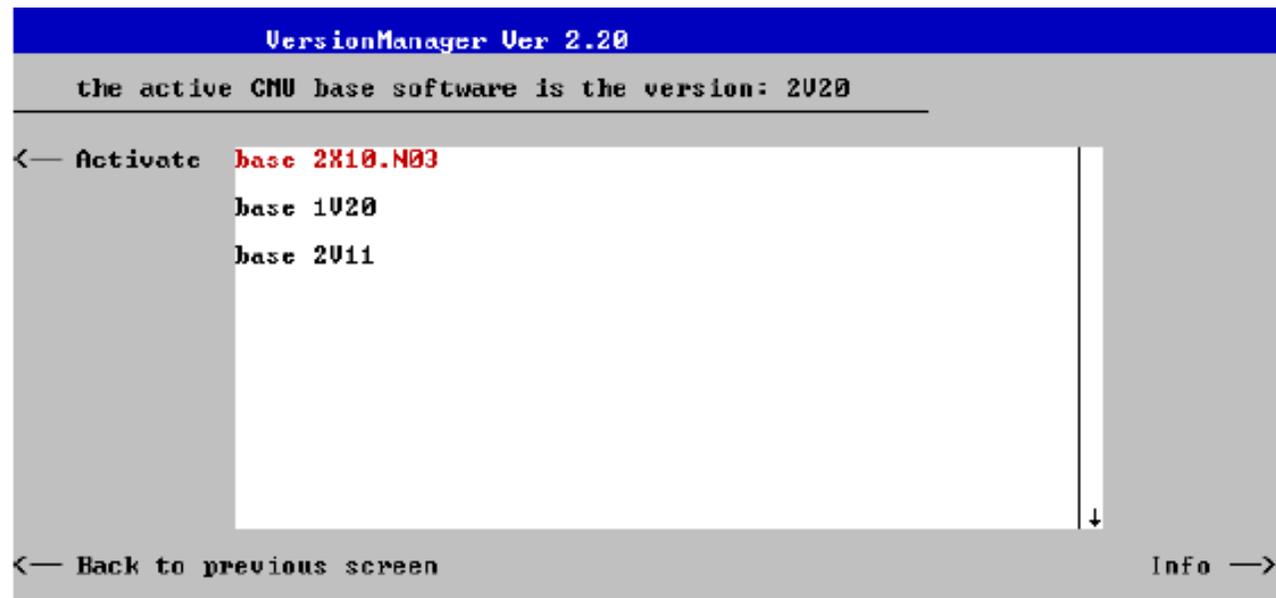
4.1 版本管理

- 利用软盘驱动或用设备前部的**PCMCIA**接口来安装新的固件。在这样的情况下新安装的软件属性必须把一段键码输入到相应的软件属性菜单里面才能激活。通过**CMU**提供的版本管理器的工具，使用户在同一设备里更方便的安装新的固件或者使用不同的应用和版本。
- 版本管理器是一个被设计成能以很方便的方式激活、删除、安装、结合以及列出不同的软件版本。并且它提供了设备的硬件以及软件版本配置信息，并且能重新设置存储在随机存储器上的启动配置。

4.2 版本更新

- 如果用户选择了“Activate other software”那么会出现如下界面：

例如，如果用户选中了“base 2X10.N03”那么这一项就会显示红色，如果用户点击“Activate”相关的热键，那么CMU就会自动完成安装。



```
VersionManager Ver 2.20
the active GNU base software is the version: 2V20
-----
<-- Activate  base 2X10.N03
                base 1V20
                base 2V11
-----
<-- Back to previous screen                               Info -->
```

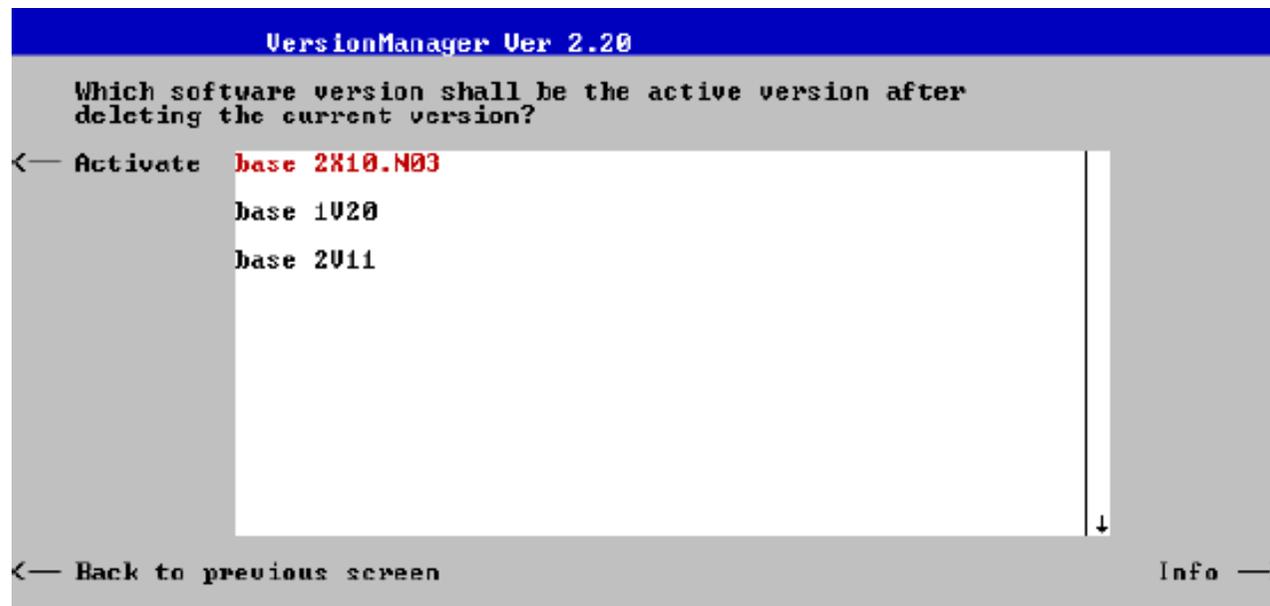
4.2 版本更新

- 如果用户选择了“Delete Software”那么会出现如下界面：

```
VersionManager Ver 2.20
the active GNU base software is the version: 2020
-----
<-- Delete  base 2020   GSM MS 2020 <active>
                IS136, AMPS 2020
                base 2X10.N03
                base 1020
                base 2011
                |
                v
<-- Back to previous screen  Info -->
```

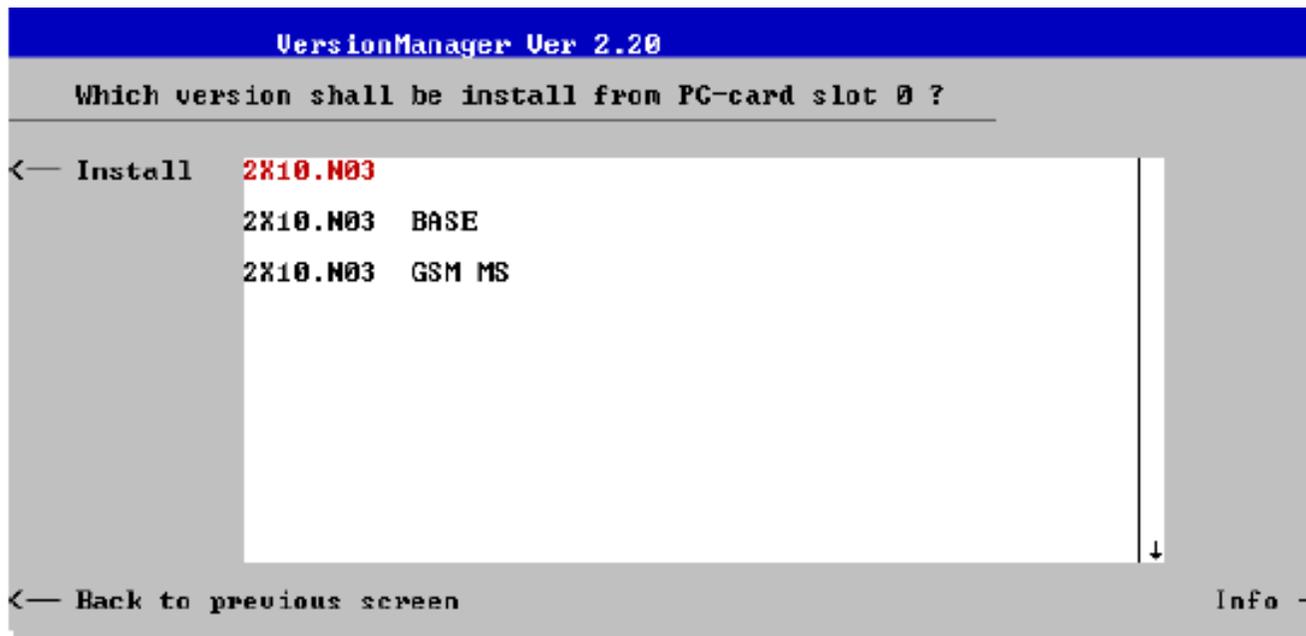
4.2 版本更新

- 如果用户点击了“Delete”的相关软键，那么当前的固件配置将会被删除，并且CMU会要求用户激活余下的软件版本中的一个。如下图：



4.2 版本更新

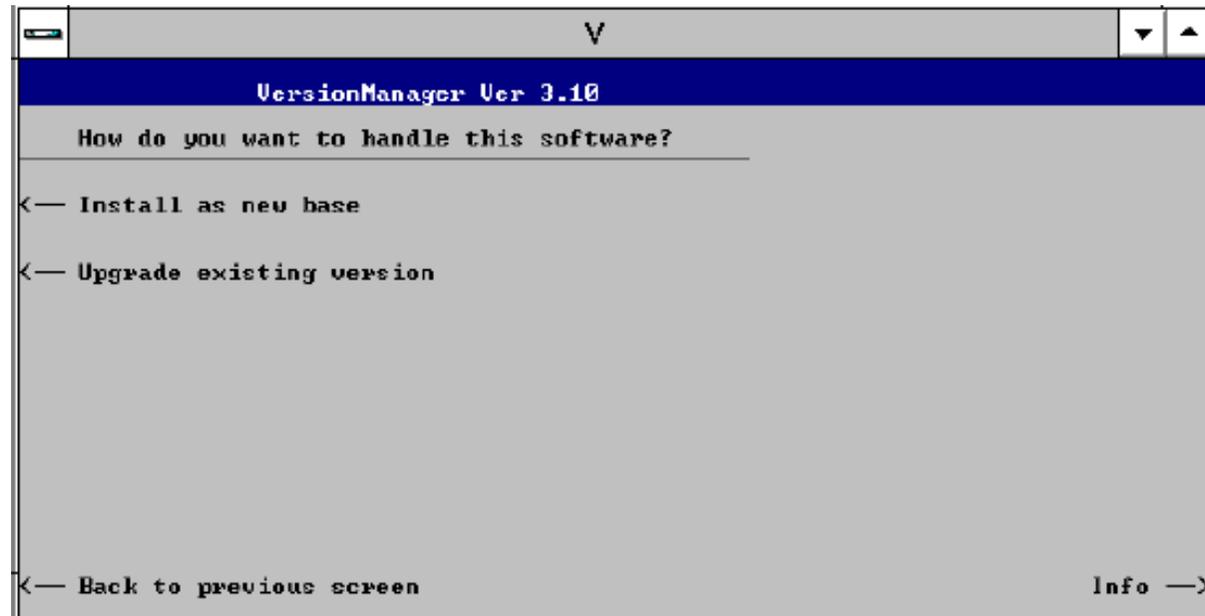
- 如果用户点击了版本管理器里“Install software from PC—card slot 0”的相关软键，那么会出现如下界面：



4.2 版本更新

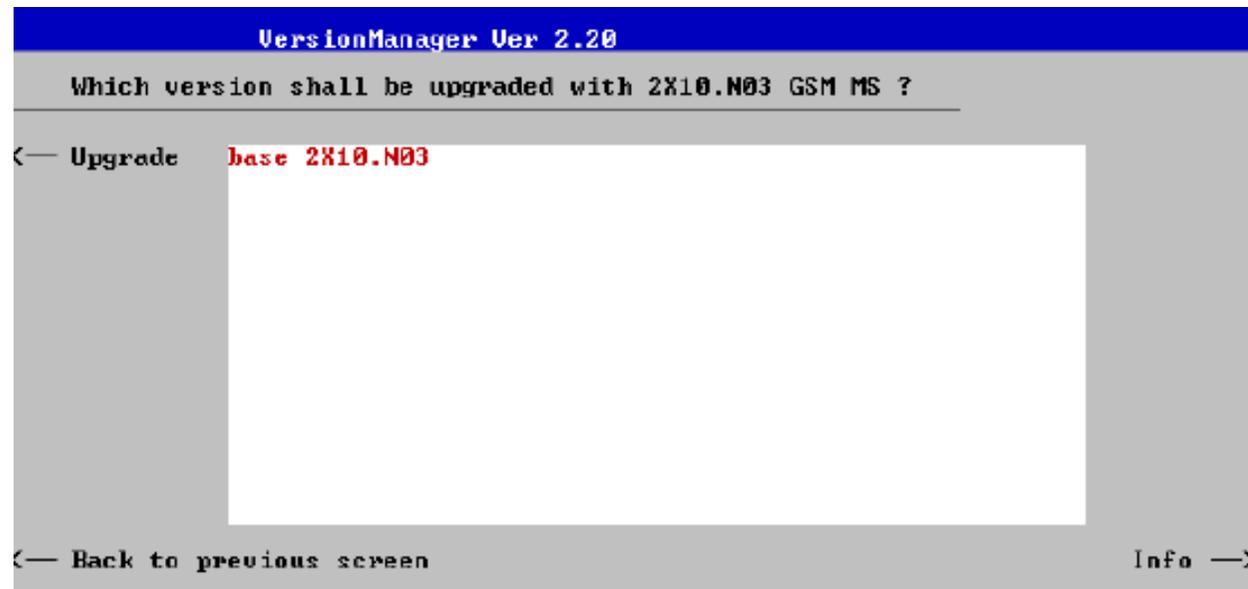
- 点击“Install”，那么CMU会自动完成安装。但是如果安装一个全新的固件的时候要么对现有的版本进行升级要么创建一个新的，这时候会出现二选一的对话框，如下图：

但是需要注意的是如果用户安装的新的基本软件版本跟已经存在的软件版本不兼容的话，那么这个对话框会被忽略，因为这时候必须进行全新的安装。



4.2 版本更新

- 如果升级存在的版本，用户可以选择一个已经存在的配置然后代替基本的软件版本，这时候会出现如下的升级选择对话框：



4.2 版本更新

- 但是如果在硬盘里面如果没有和用户选择相兼容的软件版本，那么会出现如下的出错提示框：

```
VersionManager Ver 2.20
No installed version can be upgraded with 1020 BLUETOOTH ?
-----
Base version 2021 is needed!

<— Back to previous screen                               Info —>
```

4.2 版本更新

- 最后当软件安装完成以后会出现如下的对话框：

```
VersionManager Ver 2.20
What do you want to do next with version 2020 ?

<— Install next software upgrade from PC-card slot 0
<— Install next software upgrade 2020 GSM MS from PC-card slot 1
<— Change disks

<— Finish installation                               Info —>
```

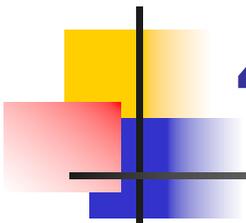
点击“Finish
installation”
安装完成。

4.2 版本更新

- 如果用户还要安装下个软件的时候，这时候CMU会自动检查是否有足够的硬盘空间，如果不够的话，会出现如下对话框：

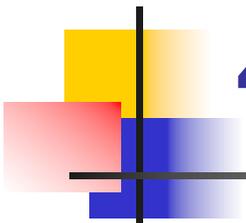
要求用户删除相应的软件版本，以腾出空间来安装新的软件。

```
VersionManager Ver 2.20
Installing a new software version requires more disk space.
Which version shall be deleted?
← Delete  base 2V20  GSM MS 2V20 <active>
           IS136, AMPS 2V20
           base 2X10.N03
           base 1V20
           base 2V11
           ↓
← Back to previous screen  Info →
```



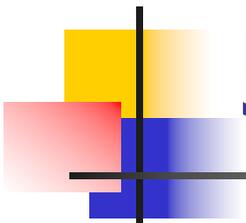
4.2 版本更新

- 版本管理器还有除有效的随机存储器内容、扫描磁盘、列出磁盘上的所有软件版本、拷贝有效的随机存储器内容到磁盘上、磁盘碎片整理等功能。



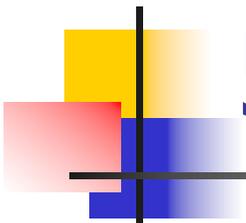
4.3 硬件操作注意事项

- 进行连接外部设备时，必须保证**CMU** 断电。
- 必须保证**CMU**置于干燥,无干扰的环境中。



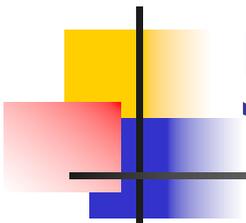
5. 测试实例介绍

- BER测试过程简述
- 1> Menu Select ->GSM 1800->Signalling-> Receive quantity ->BER
- 2> Connect Control softkey,
- 3> Ms signal hotkey
- SLOT MODE: **Single Slot**, Multislot
- PCL : **0**



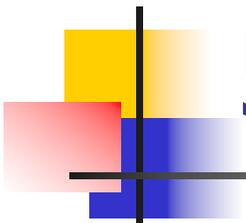
5. 测试实例介绍

- Timing advance: **0 sym.**
 - Loop : **A** ,B,C, I
- 4> BS signal hotkey
- Frequency offset : **0Hz**
 - Mode : **BCCH AND TCH,(TX)**
 - BCCH Level : **-85.0dBm.**
 - BCCH Channel: **735**



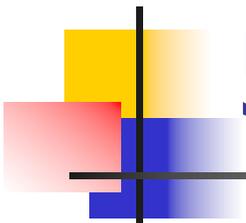
5. 测试实例介绍

- Slot mode: **Single slot**
- TCH level: unused: **-90dBm**
- Used: **-20dB**
- TCH Channel: **1850.8MHz**
- Hopping: **off**
- Time slot :**3**



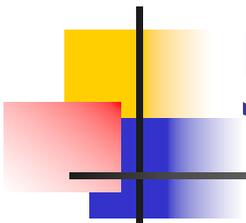
5. 测试实例介绍

- 5> Net Work hotkey
- Traffic mode : **FULL RATE VERSIONG 1**
- Bit stream: **2E9-1PSR BIT PATTERN**
- 6> RF
- **RFOUTPUT RF2,**
- EXT.ATT OUTPUT : **0.5dB.**
- **RFINPUT RF2 ,**
- EXT.ATT INPUT : **0.5dB**



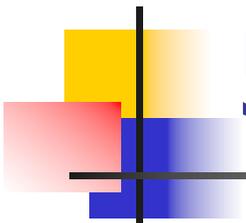
5. 测试实例介绍

- 7 > Analyzer level
- RF max level .:**30**dBm (limit is 39dBm)
- RF MODE **AUTO**, PCL/Gamma, manual,
- RF attenuation :**LOW noise**, normal , low distortion,
- TRIGGER SOURCE: **signaling**, Free run, RF Power, IF Power,
- Trigger slope :**Rising edge**, falling edge
- Trigger Level: High, Medium, Low



5. 测试实例介绍

- 8> BER Soft key
- Stop condition : RF level search, confidence level, **none**, 1st limit exceeded, all
- limits exceeded.
- Frames: **200,000** output limit is 200 000.



5. 测试实例介绍

- Test setup: **test1** Test(1~10)
- Measure mode: BER, Burst by Burst , **RBER/FER**, BER/DBLER, AMR
- Inband FER.
- 9> BER ->limits: BER->test1->FER :0.041%
- 10> Connect control -> connect mobile,