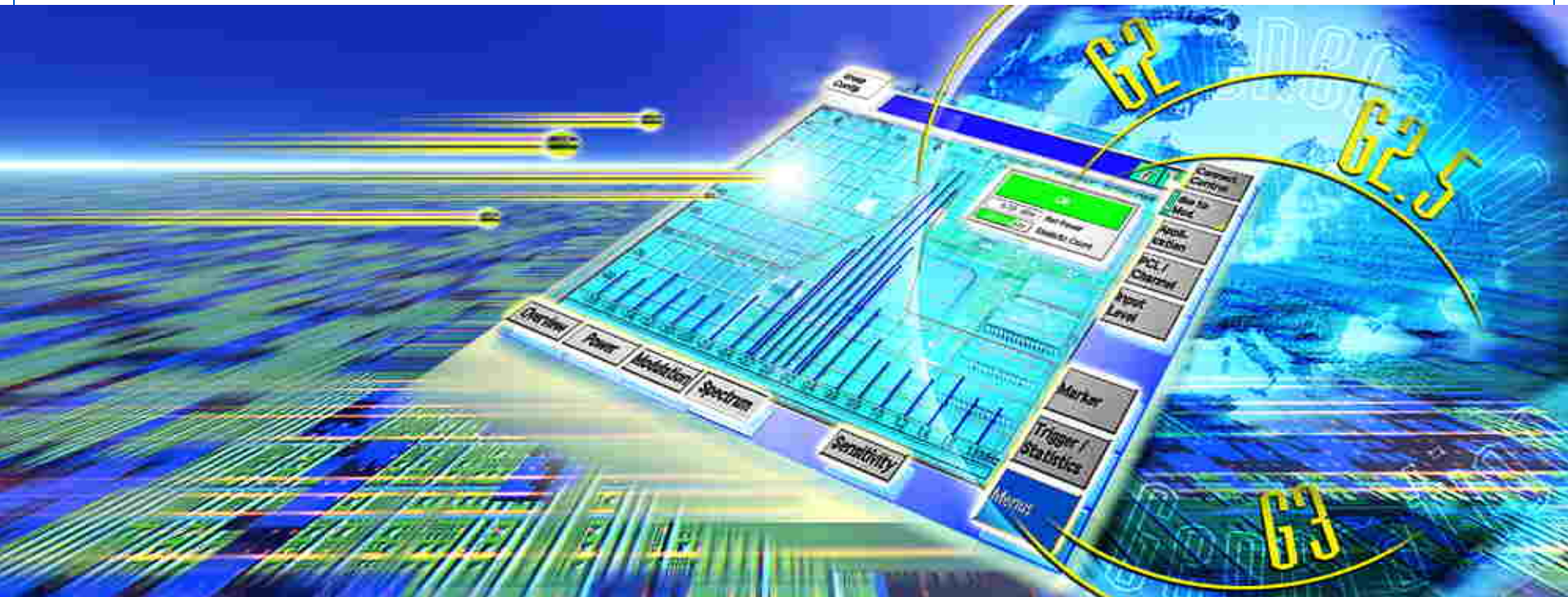
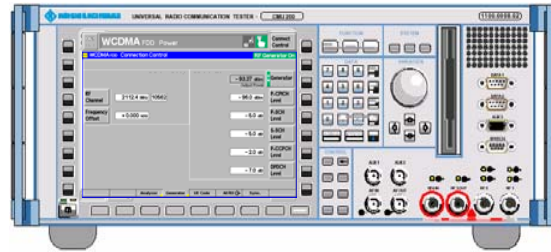


通用无线通信测试仪 CMU200 / CMU300

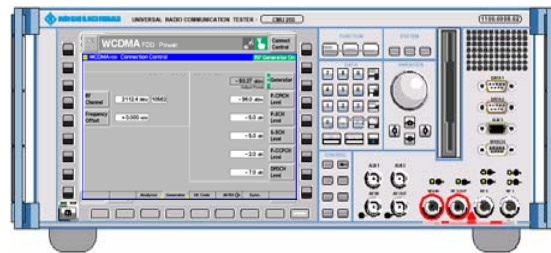


通用无线通信测试仪 CMUx

❖ CMU200 – 移动台测试仪



❖ CMU300 – 基站测试仪



CMU 介绍

❖ 理念:

- ❖ 用于基站和移动台射频测试的无线通信测试仪（发射/接收）

❖ 支持的通信标准:

- ❖ GSM / GPRS / EDGE
- ❖ WCDMA
- ❖ IS-95 / CDMA2000 1x / 1x EV-DO / 1xEV-DV (只有CMU200具备)
- ❖ AMPS / IS136 (只有CMU200具备)
- ❖ Bluetooth (只有CMU200具备)

❖ 可能的应用:

- ❖ 生产
- ❖ R&D
- ❖ 一致性测试
- ❖ 衰退测试
- ❖ 安装
- ❖ 维修

CMU 亮点

❖ 速度:

❖ 创新的测试方法导致了最快的测试时间。几乎在同一个时间可以进行不同的TX测试

❖ 例如:

- ❖ 在每帧都测量一个power ramp, 也就是说每秒可以有200次测量!
- ❖ 在8PSK调制时, 每秒大约100次测量!
- ❖ WCDMA CDP 在没有外部触发的时候 (test model 3.32) 测量每帧大约使用0.3秒!

❖ 精度:

❖ 组合的在线校正程序用于温度, 电平和频率, 这样可以提高精度, 比以前的一体化测试仪的发生器好大约3倍。

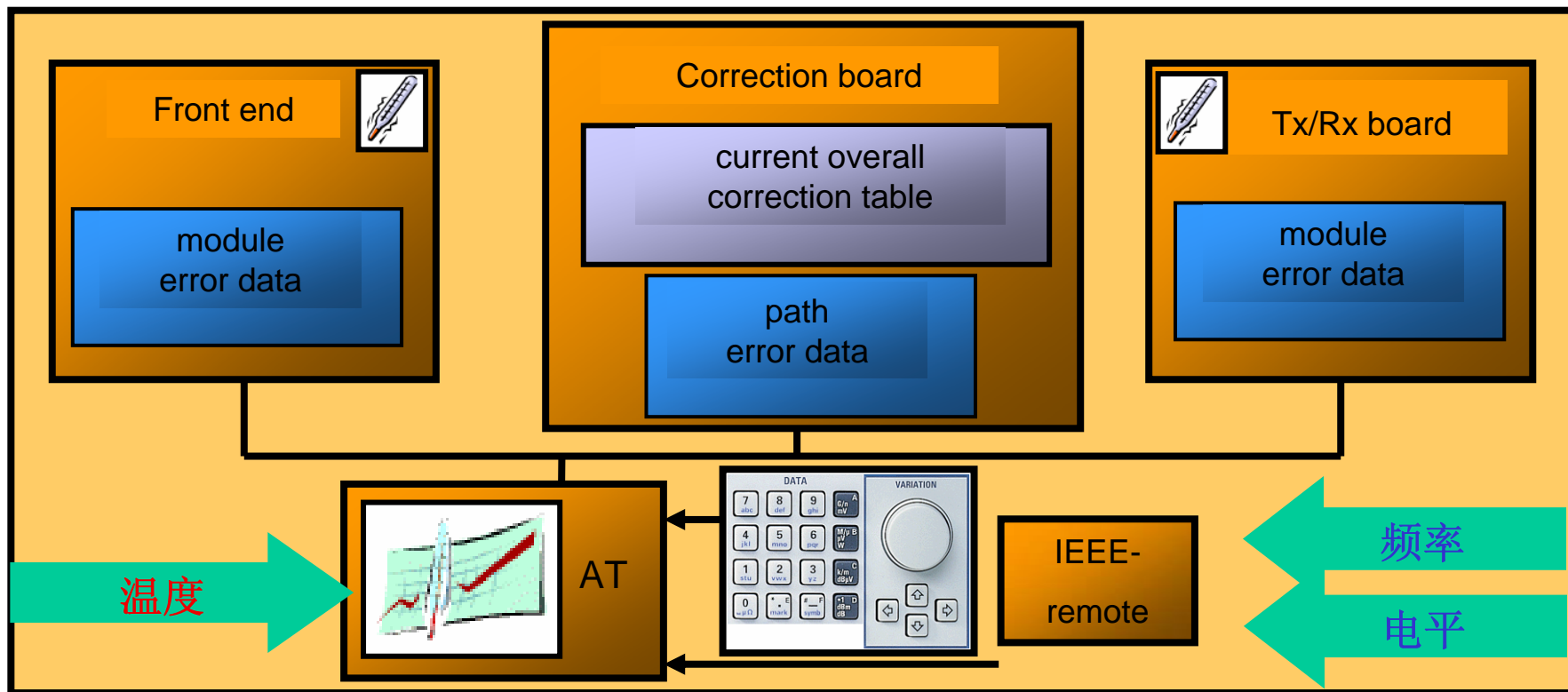
❖ 例如:

- ❖ 功率测量精度0.5db(在整个功率和频率范围上)!
- ❖ 用于GSM BER的发电器的输出精度为0.6db!

❖ 可靠性:

❖ 低功率消耗 (<200W) 和创新的冷却思想。

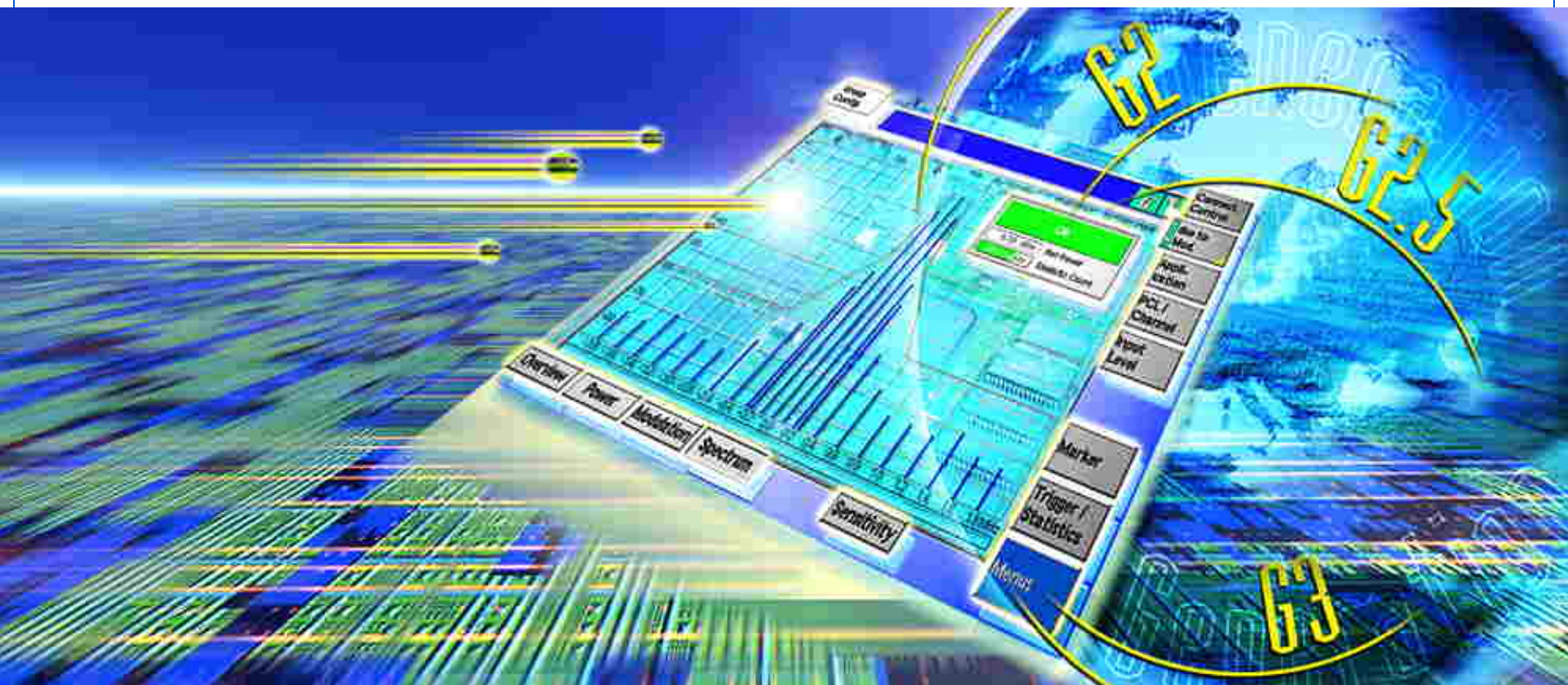
CMU 的自动温度补偿



自动温度补偿使CMU200能在较大温度范围内保证测试精度。不需要进行手动温度校准。

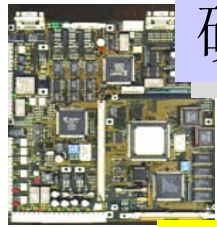
用于移动台测试的无线通信测试仪: R&S™ CMU200

for Bluetooth / IS95 / CDMA2000 1x / 1xEV-DO / 1xEV-DV / GSM / GPRS /
EDGE / WCDMA (new!)



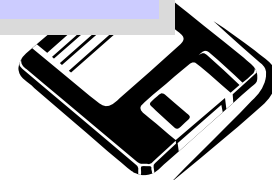
Status 11/ 2003, CMU200 SW version V3.50

CMU200 多协议测试仪



硬件Options

软件Options



1xEV-DV

1xEV-DO

CDMA2000

cdmaOne

AMPS

TDMA

AUDIO
Generator/Analyzer

CMU Basic Unit

标准-独立测试



RF Generator/Analyzer

Spectrum

Pwr vs. Time

HSCSD

GPRS

GSM

EGPRS

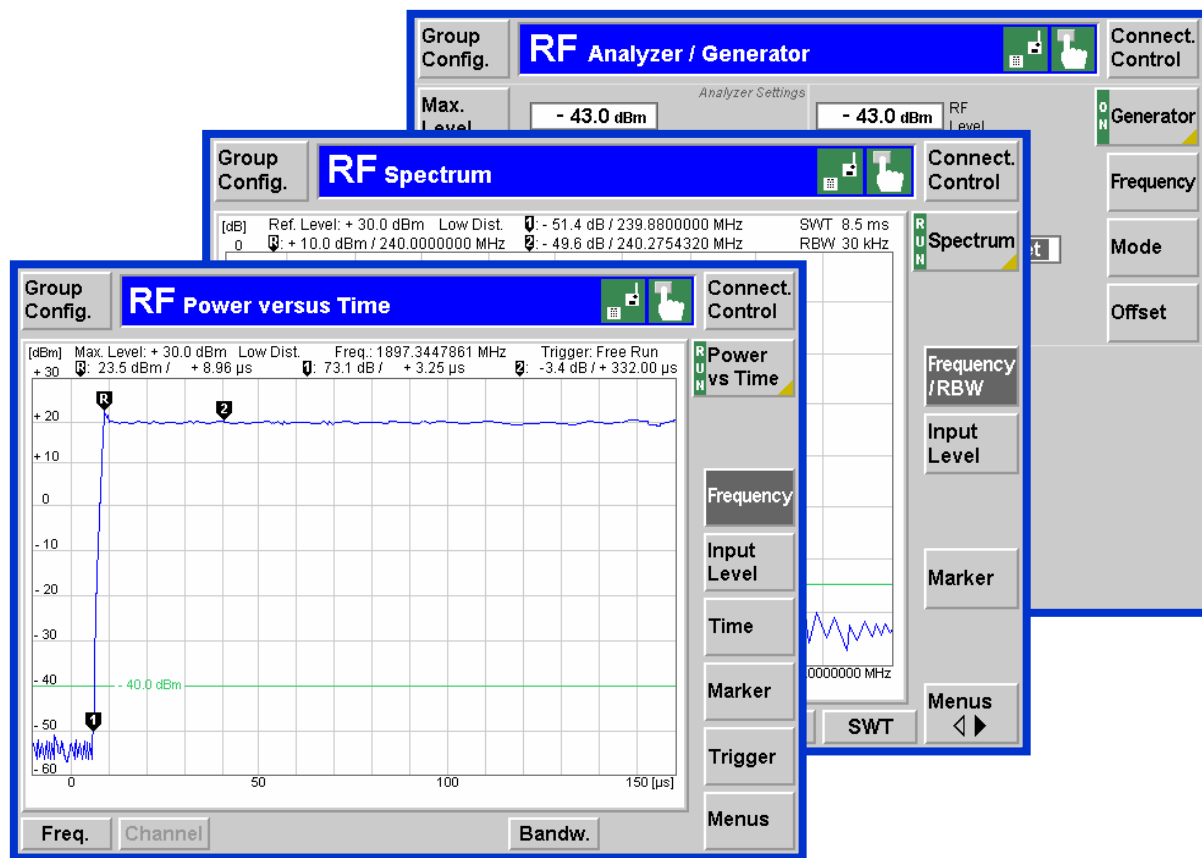
Bluetooth

WCDMA

CMU200 Base Unit

射频功能

- ❖ 信号发生器/分析仪
- ❖ 频谱分析仪
- ❖ 功率计（时域）



CMU200 Base Unit

射频功能

❖ 信号发生器

❖ CW

❖ AM

❖ SSB

❖ FM

- 最大400kHz deviation

❖ 支持Hopping

- 2个频点

❖ 支持Ramp

The screenshot displays the software interface for the CMU200 Base Unit, showing three channels (Ch. 1 and Ch. 2) configured as RF Analyzer / Generator. The main window is titled "RF Connection Control" and shows the "Generator Tx/Frequency Hopping/Hopping" settings. The "Generator Tx" section is expanded, showing the following settings:

Parameter	Value
Modulation Index	100.0 %
Modulation Filter	300 kHz
FM Frequency	50.000 kHz
FM Deviation	400.000 kHz
Generator Tx	<input type="checkbox"/>
Default Settings	<input type="checkbox"/>
Generator Control	ON
Level	- 27.0 dBm
Frequency	1200.0000000 MHz
Frequency Hopping	<input type="checkbox"/>
Hopping	On
Hopping Frequency	1550.0000000 MHz
Hopping Mode	Absolute
Ramping	On
Low Spur Mode	Off

The interface also shows a status bar at the bottom with "Analyzer", "Generator", "RF", and "Sync." buttons, and a page indicator "1 2".

CMU200 Base Unit

音频测试 option B41

Audio
Analyzer/Generator

RUN	Analyzer 1	RUN	Analyzer 2	AF Voltage	Settings
	0.06 mV		0.05 mV	Peak 1	<ul style="list-style-type: none"> ▼ Meas. Control ▼ Analyzer 1 <ul style="list-style-type: none"> Repetition: Continuous AF Path Coupling: AC Distortion Freq.: 1.0000 kHz ▼ Analyzer 2 <ul style="list-style-type: none"> Repetition: Continuous AF Path Coupling: DC Distortion Freq.: 1.0000 kHz ▼ Analyzer Level <ul style="list-style-type: none"> ▼ Analyzer 1 <ul style="list-style-type: none"> AF Max. Level: 1.00000 V AF Mode: Auto ▼ Analyzer 2 <ul style="list-style-type: none"> AF Max. Level: 1.00000 V AF Mode: Auto ▼ AF Generator <ul style="list-style-type: none"> ▼ Generator 1 <ul style="list-style-type: none"> Control: OFF Signal: AC Level: 1.00000 V Frequency: 1.0000 kHz ▼ Generator 2
	0.02 mV		0.01 mV	RMS 1	
	0.01 mV		0.01 mV	Peak 2	
	0.00 mV		0.00 mV	RMS 2	
	0.00 mV		-0.06 mV	DC	
----		----		Frequency	
	97.5 %		96.2 %	Distortion	
	(1.0000 kHz)		(1.0000 kHz)		

AUX1

Analyzer 2

AUX2

Generator 2

AF IN

Analyzer 1

AF OUT

Generator 1

Analyzer Generator

Multitone

Menus

RUN Analyzer 1

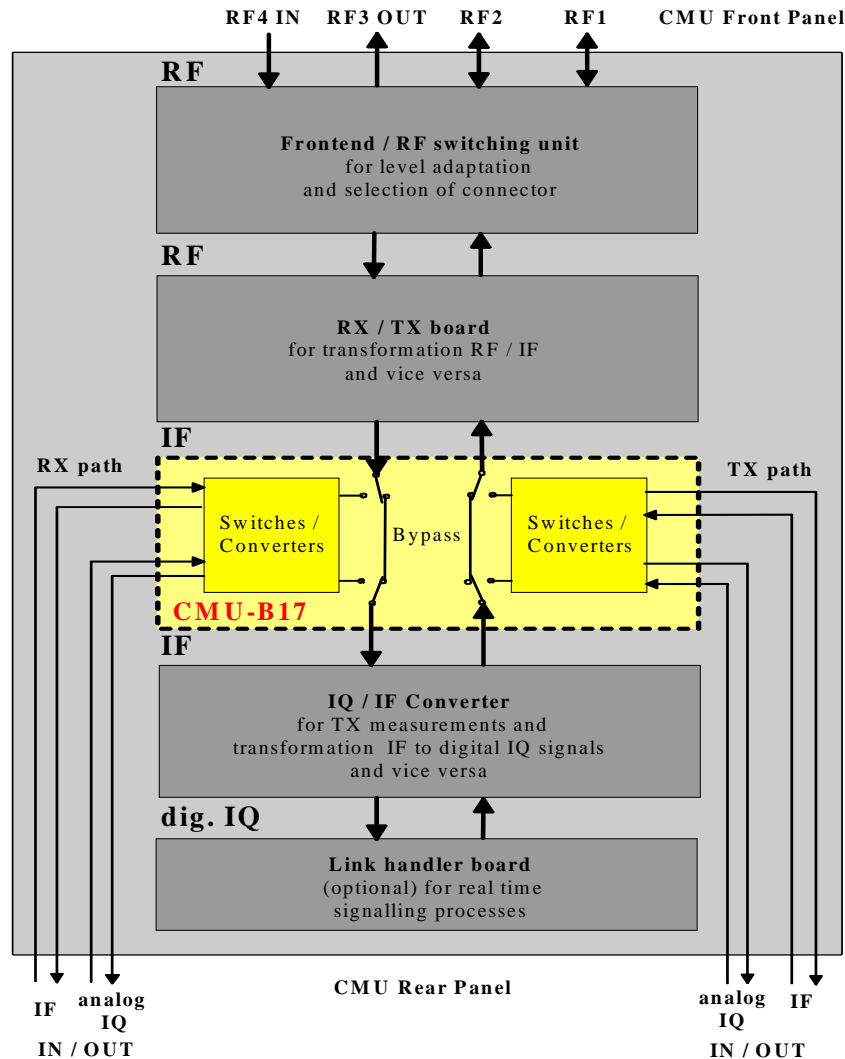
Application

Analyzer Level

Generator

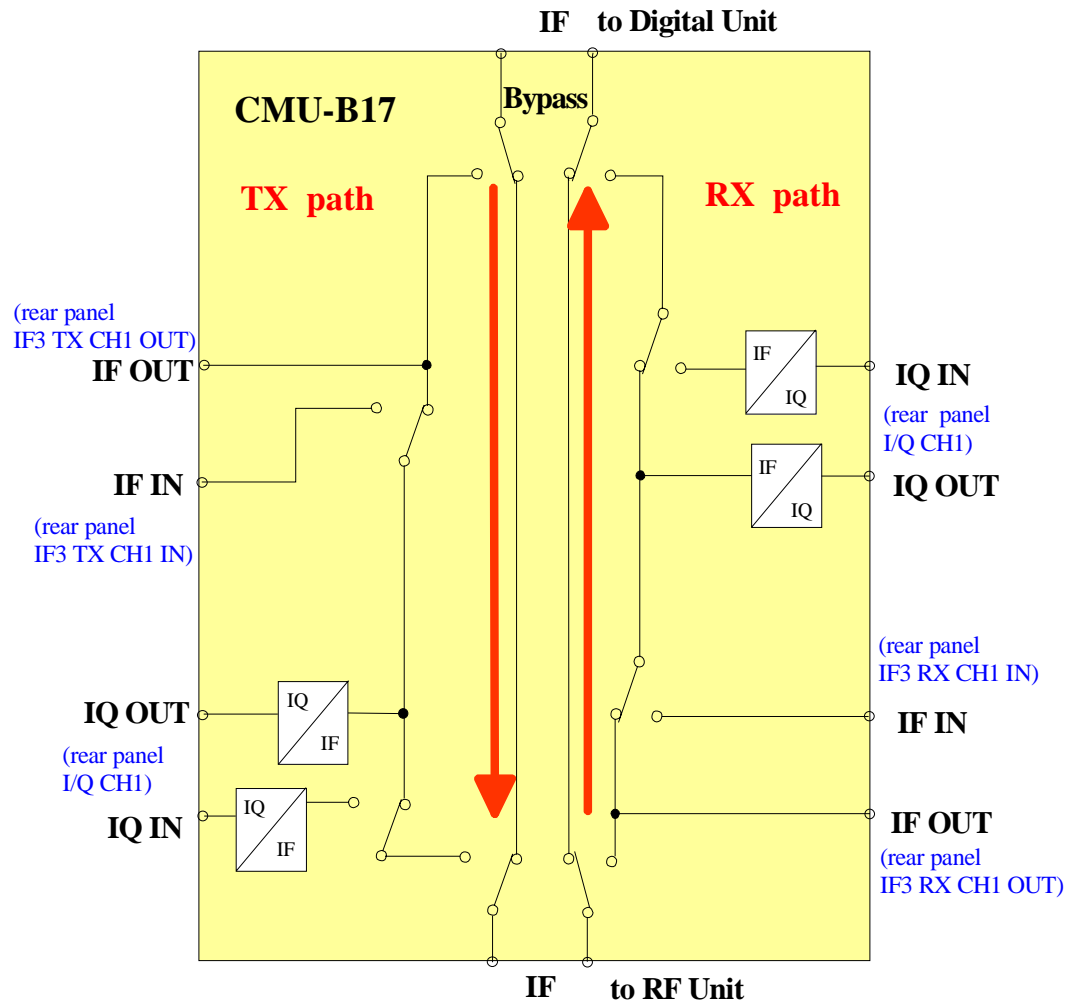
CMU200 Base Unit

IF/IQ 接口 option B17



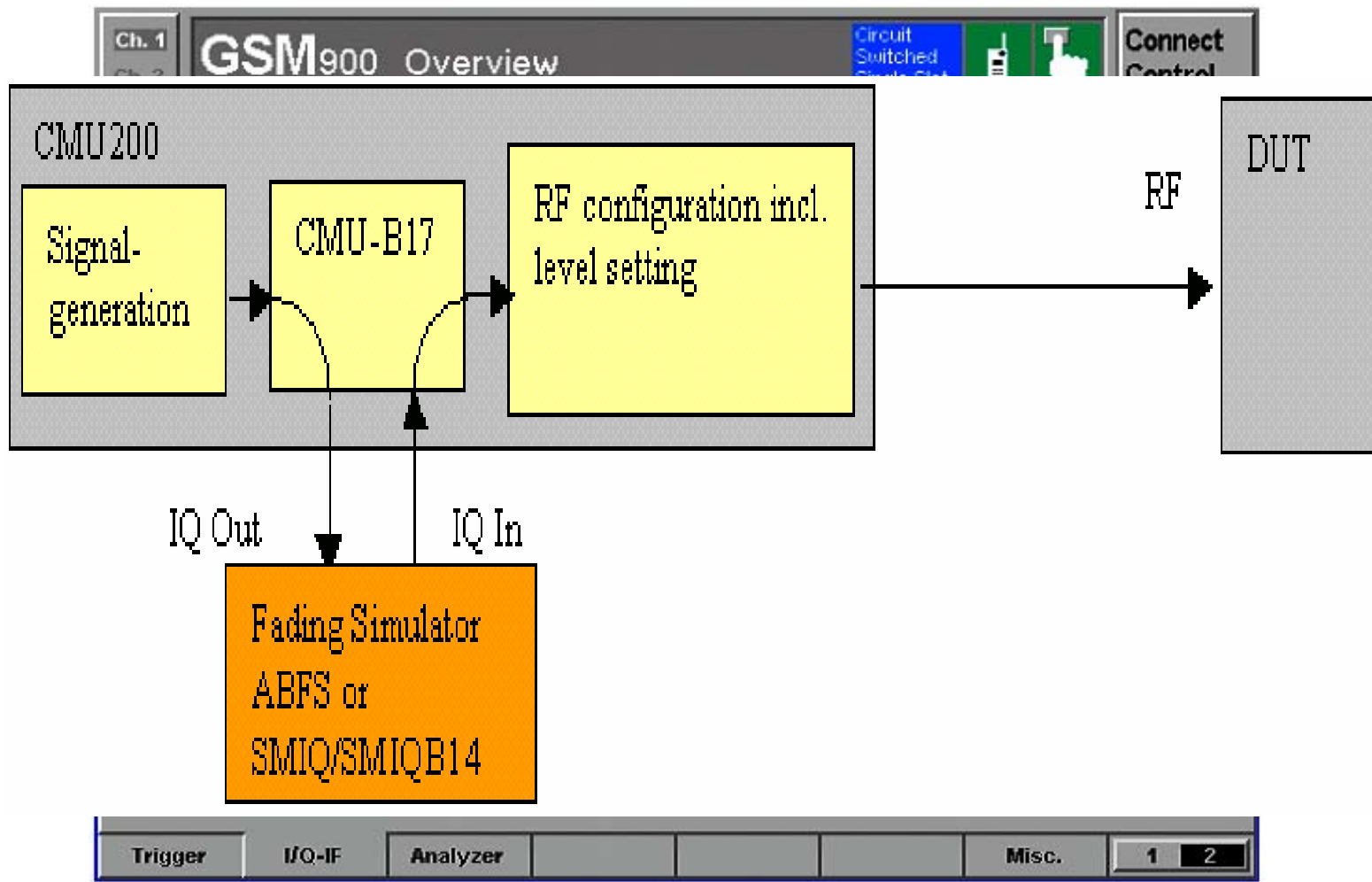
CMU200 Base Unit

IF/IQ 接口 option B17



CMU200 Base Unit

IF/IQ 接口 option B17



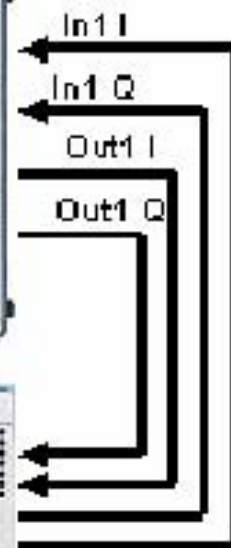
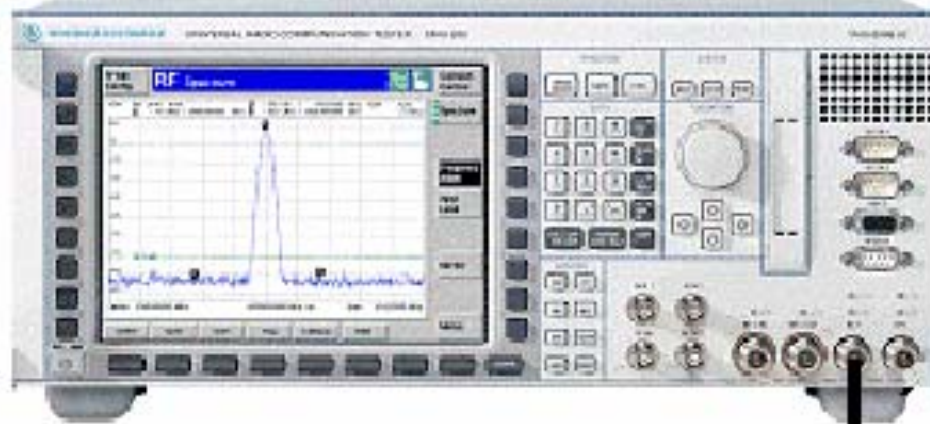
CMU200 Base Unit

B17与基带衰落模拟器的连接图

ABFS/
SMIQ



CMU
200/300



RF2



CMU200 3GPP

GSM/GPRS/EDGE/WCDMA FDD



CMU200 3GPP

GSM

❖ Non-signaling

❖ Signaling

❖ 功率

- Power vs. time
- Power vs. slot
- Power vs. PCL

❖ 调制

❖ 频谱

- 调制频谱
- 开关频谱

❖ 接收质量

- BER
 - Burst by Burst
 - BER / DBLER
 - BER
 - RBER / FER
- RX level / RX quality

The screenshot displays the CMU200 3GPP software interface. At the top, there are seven channel configurations (Ch. 1 to Ch. 2) for GSM900, including Power, Modulation, Spectrum, and Receiver Quality. The main window shows the Receiver Quality settings for a selected channel. The settings include:

- Class II:** 3.276 %
- Class Ib:** 0.505 %
- CRC Err.:** 0
- 100 Speech Frames** (Time: 0 s to 2.00 s)
- Test Setup:** Test 1
- Meas. Mode:** BER
- Traffic:** Full Rate Version 1
- Bit Stream:** PRBS 2E9-1
- Main Slot:** 3
- RX Level:** 20 (-91 to -90 dBm)
- RX Quality:** 0 (0.0 to 0.2 %)

The Settings panel on the right shows the following configuration:

- Signalling States:** H L T
- MS Capabilities:**
 - IMSI: 001.01.1000000095
 - IMEI: 330000.00.000000.0
 - Dialled Number: -
 - Traffic Mode: Full Rate Version 1
- Meas. Control:**
 - Stop Condition: 1st Limit exceeded
 - Frames: 100
 - Test Setup: Test 1
 - Meas. Mode: BER
- Analyzer Level:**
 - MS Signal:
 - Circuit Switched:
 - Timing Advance: 0 Sym.
 - Single Slot:
 - PCL (MS): 15 (13.0 dBm)
 - Timeslot: 3
 - BS Signal:
 - Circuit Switched:
 - TCH BER Level:

The interface includes navigation buttons at the bottom: Overview, Power, Modulation, Spectrum, Receiver Quality, Audio, and Menus.

CMU200 3GPP GSM/(E)GPRS

优势 – 新的频谱测量



用于GSM/(E)GPRS(调制方式GMSK/EDGE)的新的，更丰富的频谱测试应用

- ❖ 非常快（如果配备CMU-U65v4则速度更快）
- ❖ 更宽的带宽 **+ - 2,5MHz** (如果配备CMU-U65V04则可以测试大于 **+ - 1.8MHz**的频谱)
- ❖ 调制频谱和开关频谱可以**并行**工作
- ❖ **时域**可以和**频域**并行处理(在一个菜单下显示)
- ❖ **GMSK/8PSK**自动检测 (相应的容限检查)

CMU200 3GPP GSM/(E)GPRS



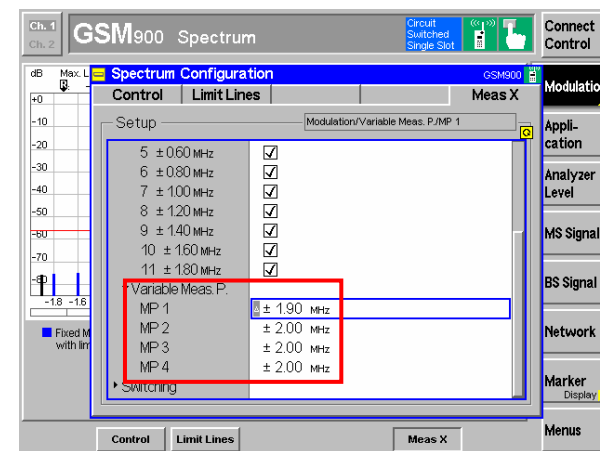
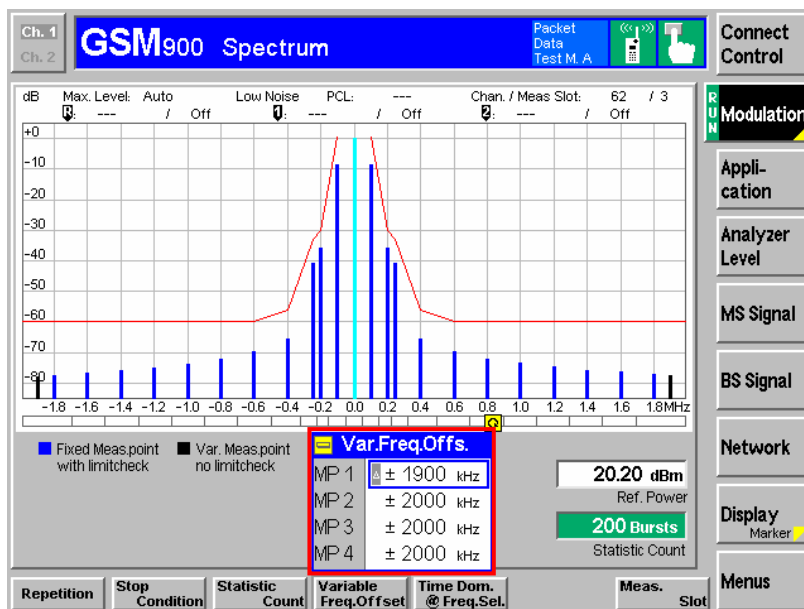
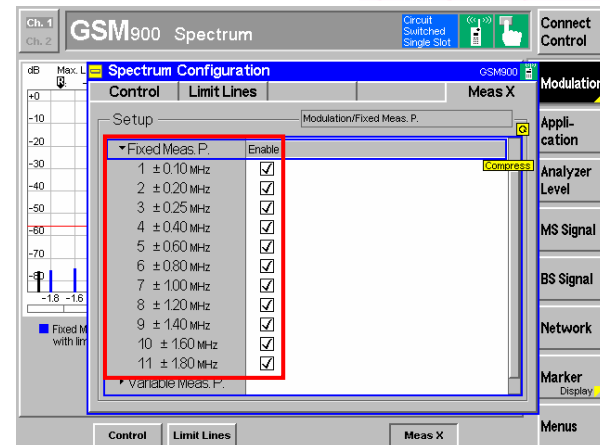
优势 – 新的频谱测量

❖ 一般特性 (Switching, modulation, switching & modulation)

❖ 更宽的频率范围

- $\pm 1.8\text{MHz}$ (基本)
- $\pm 2.5\text{MHz}$ (需要option CMU-U65V04)

❖ 4个可能的附加测试点, 用于定制的研究



CMU200 3GPP GSM/(E)GPRS

优势 – 新的频谱测量

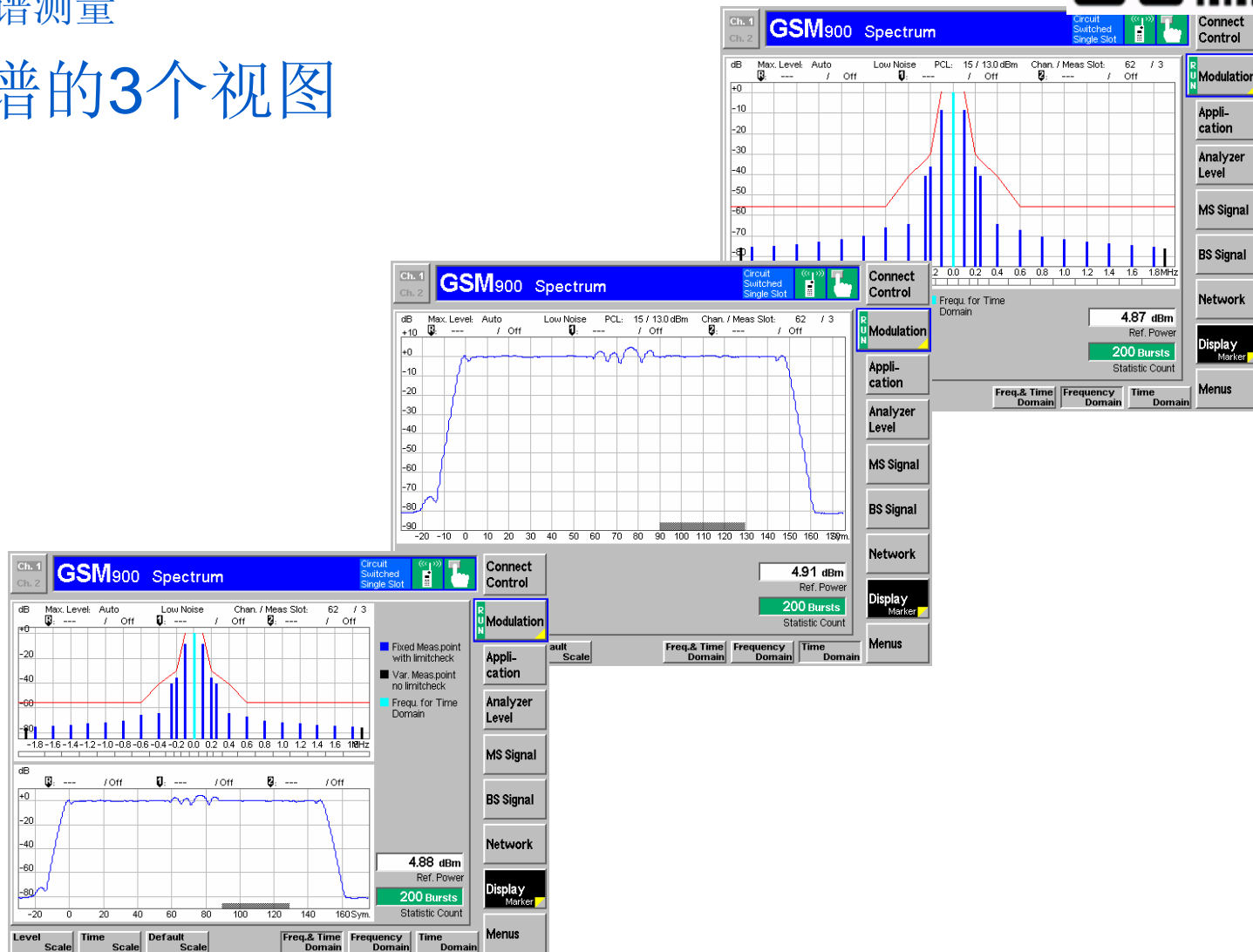


❖ 调制频谱的3个视图

❖ 频域

❖ 时域

❖ 频域和时域

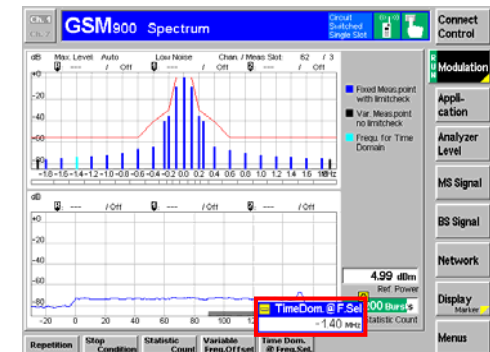
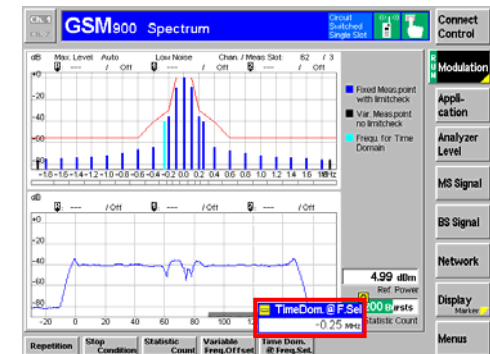
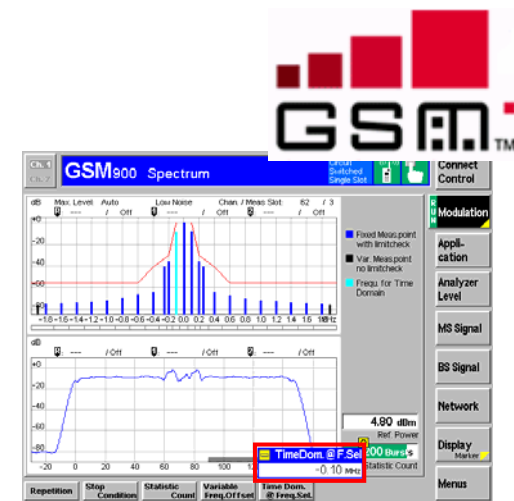
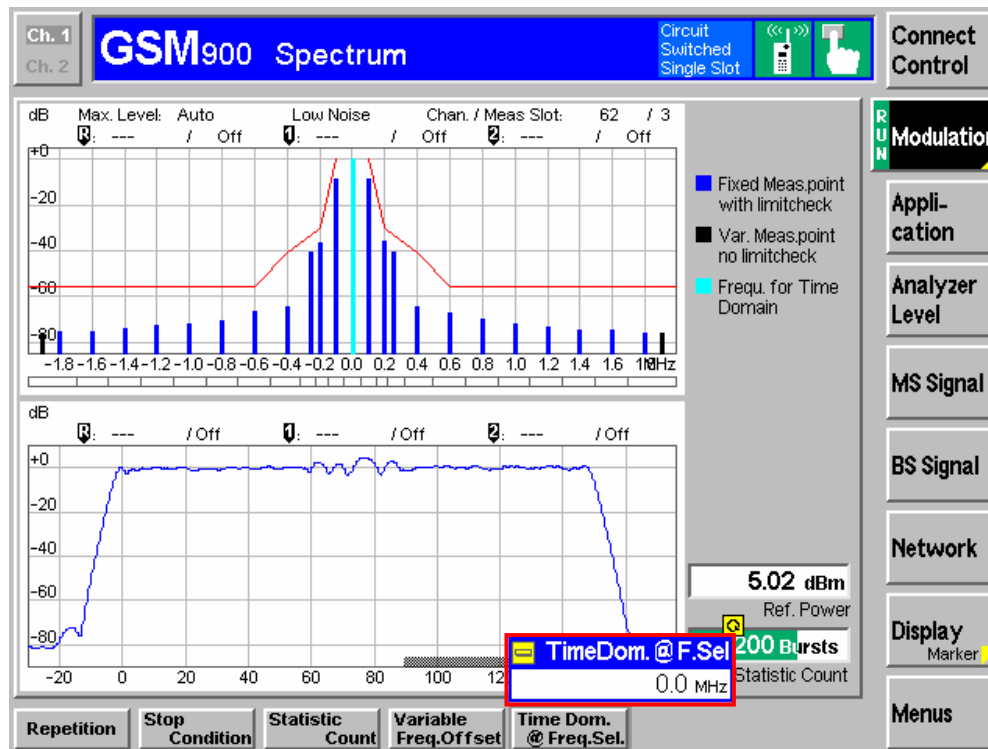


CMU200 3GPP GSM/(E)GPRS

优势 – 新的频谱测量

❖ 调制频谱在频域和时域

- ❖ 对于任意频率偏移的时域显示
- ❖ 用于测量的平均区域被标示出



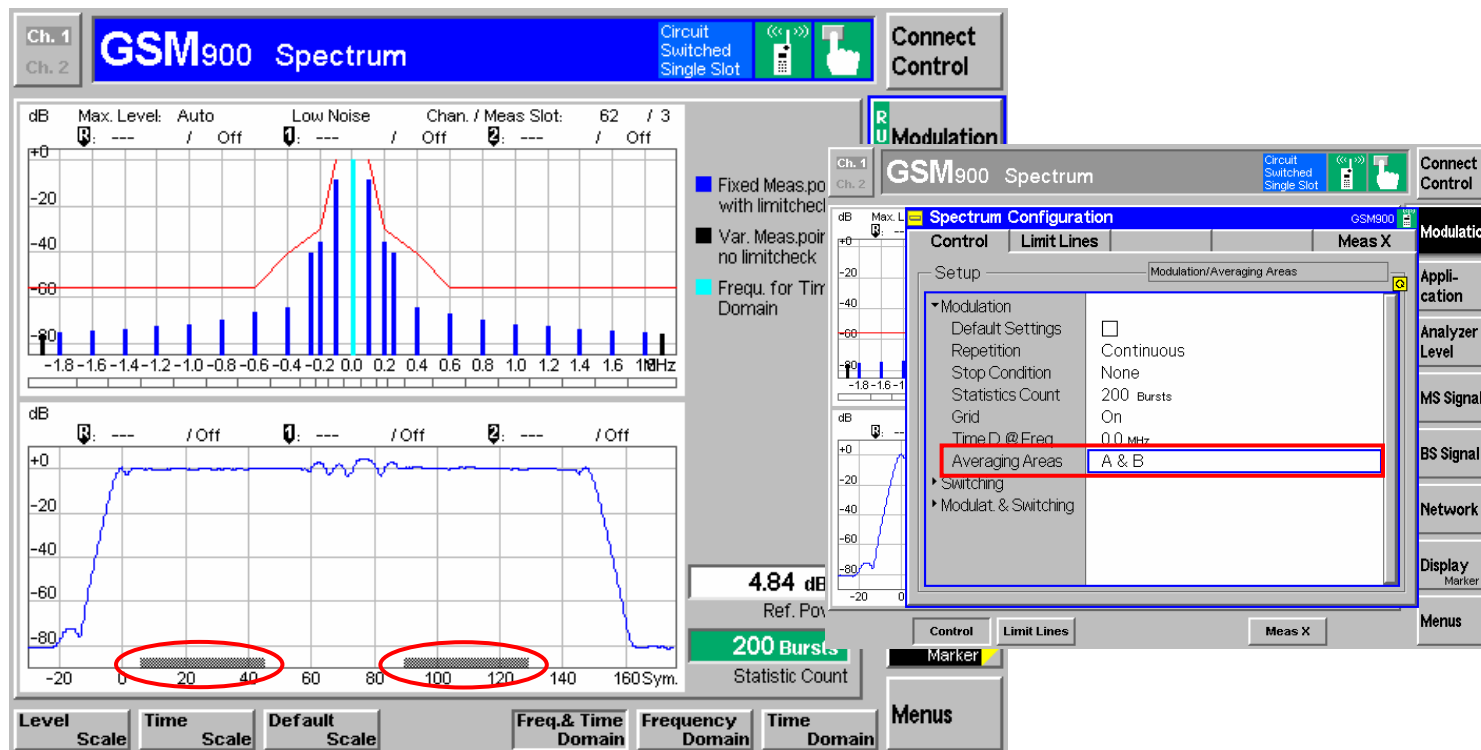
CMU200 3GPP GSM/(E)GPRS



优势 – 新的频谱测量

❖ 可以选择的采样区间

- ❖ 第一数字段 – “A”
- ❖ 第二数字段 – “B” (缺省设置依照3GPP标准)
- ❖ 第一和第二数字段 – “A&B” (能够被用于削减测量时间)



CMU200 3GPP GSM/(E)GPRS

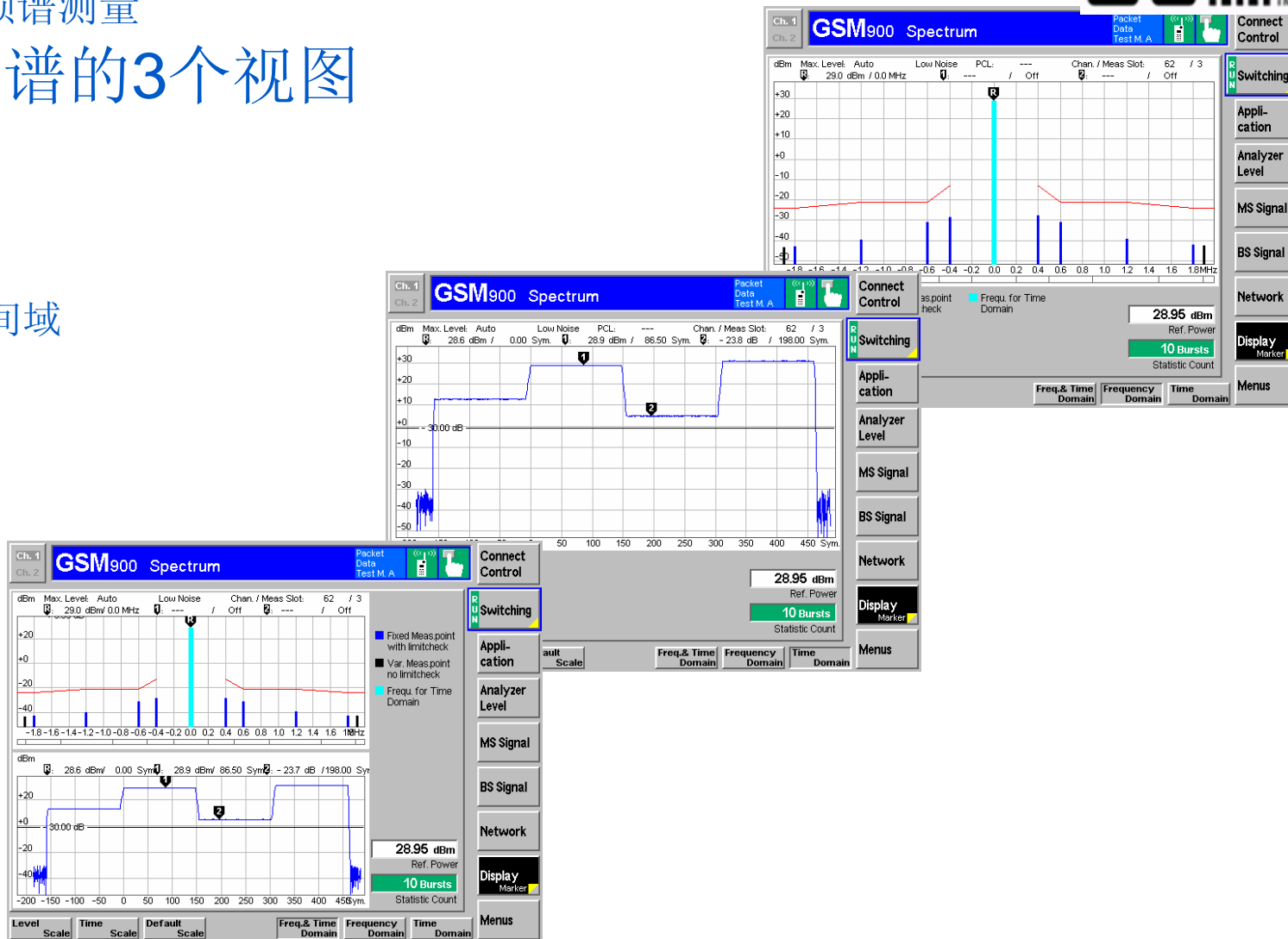
优势 – 新的频谱测量

❖ 开关频谱的3个视图

❖ 频域

❖ 时域

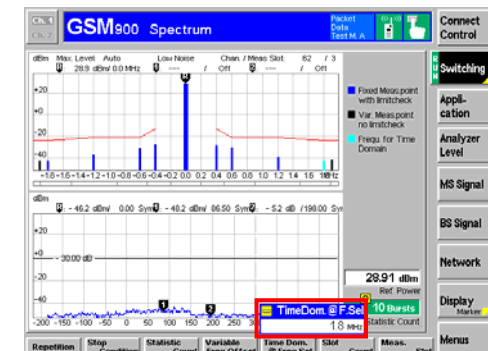
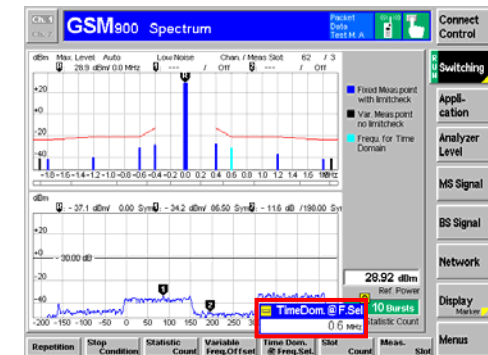
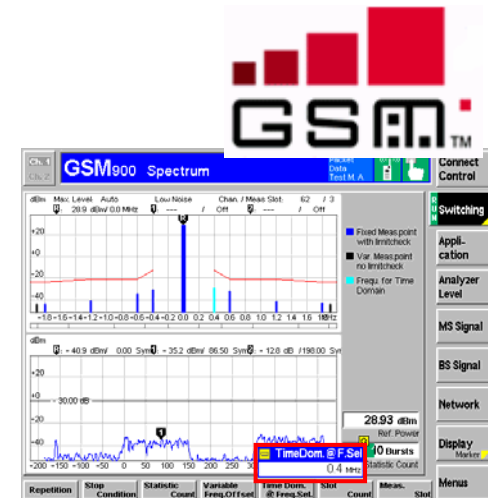
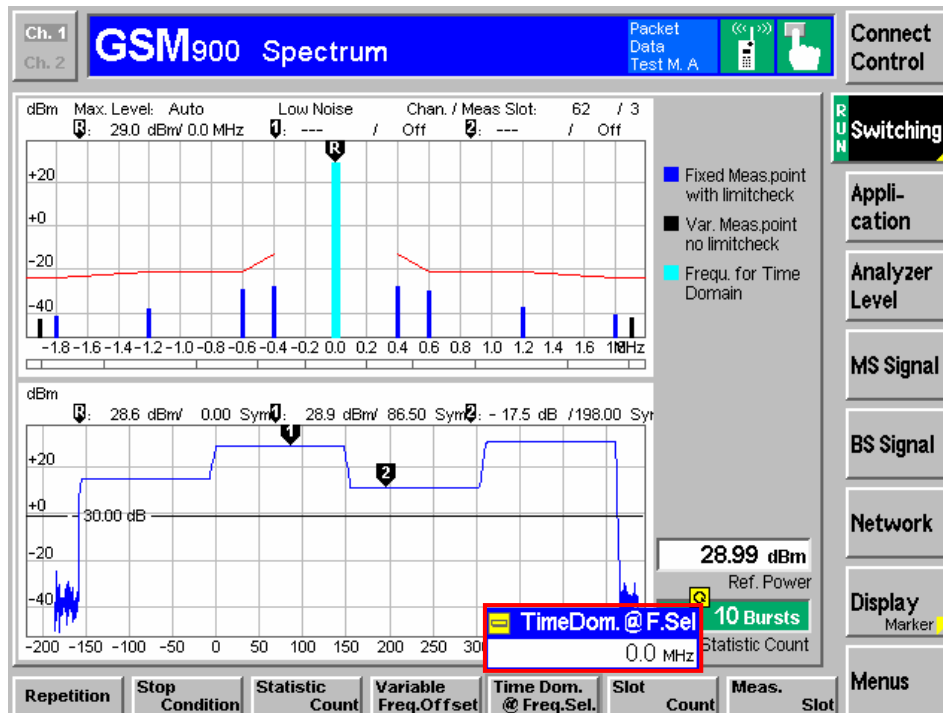
❖ 频率和时间域



CMU200 3GPP GSM/(E)GPRS

优势 – 新的频谱测量 开关频谱在频域和时域

- ❖ 在载波频率上，可以测量有用部分的宽带平均功率。
- ❖ 在邻道上依照3GPP，使用30kHz的RBW和100kHz的VBW来测量。
- ❖ 时域视图可以用于任意的频率偏移
- ❖ 时域视图允许方便定位造成频谱异常的瞬态区域

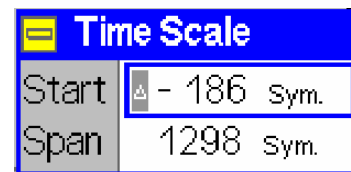
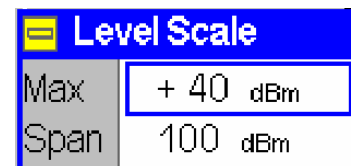
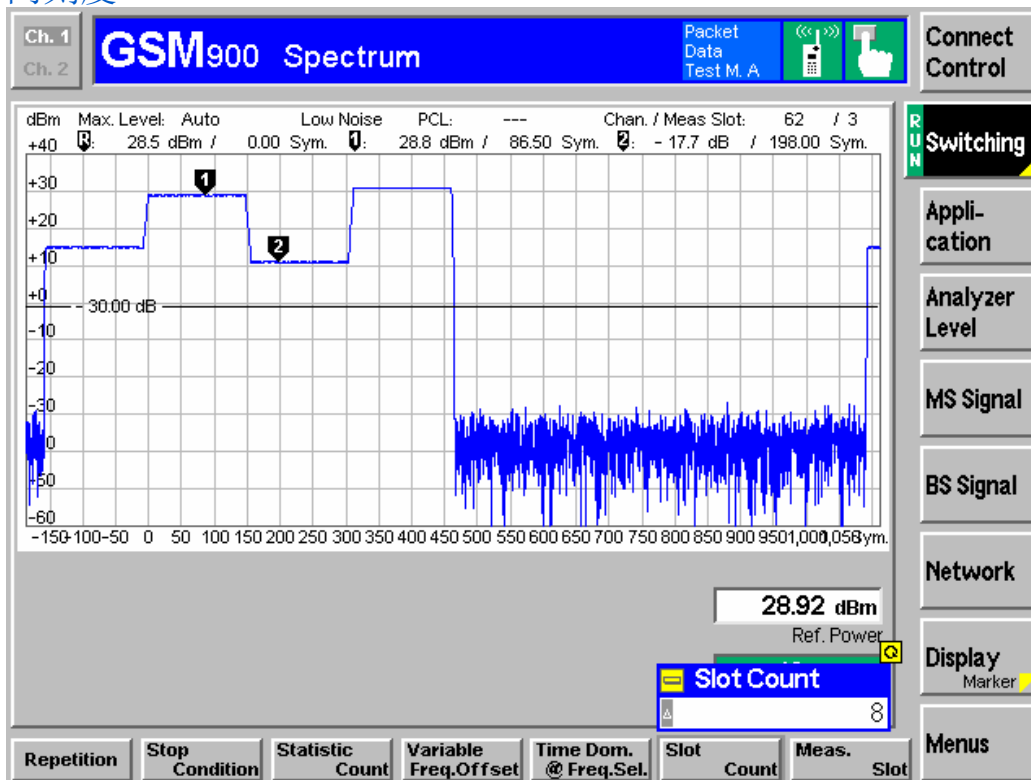


CMU200 3GPP GSM/(E)GPRS

优势 – 新的频谱测量

❖ 时域 – 自由方便的刻度

- ❖ 时隙数从1到8（速度最优化）
- ❖ + 自由的电平刻度
- ❖ + 自由的时间刻度

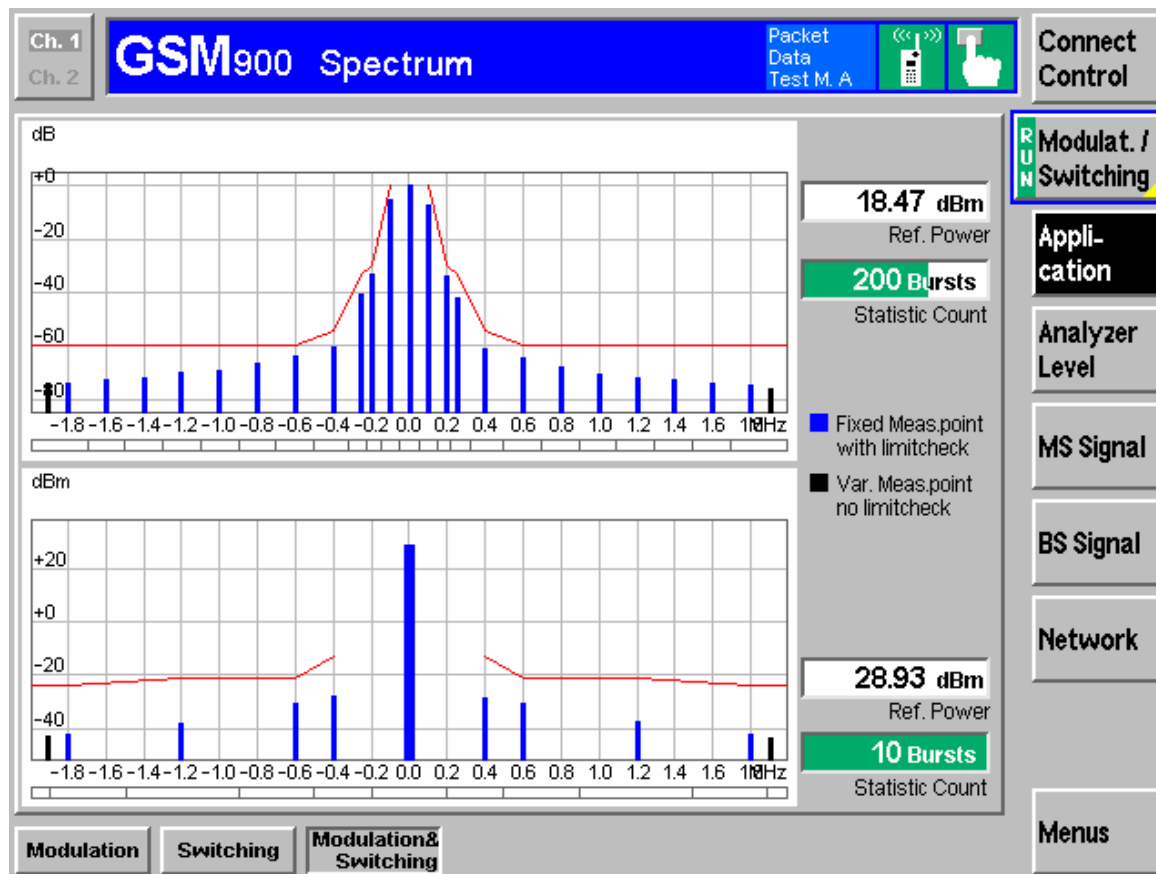


CMU200 3GPP GSM/(E)GPRS

优势 – 新的频谱测量



❖ 并行的调制频谱和开关频谱



CMU200 3GPP (E)GPRS



❖ Non-signaling

❖ Signaling

❖ 功率

- Power vs. time (1-4 slots)

❖ 调制

❖ 频谱

- 调制频谱 (f, t)
- 开关频谱 (f, t)

❖ 接收质量

- BER
- BLER
- C value / RX quality

Ch. 1	Ch. 2	Test Name	Controls	Connect
Ch. 1		GSM900 Power	Pack. Data, << >>	Connect
Ch. 1	Ch. 2	GSM900 Power	Pack. Data, << >>, Test M. A	Connect Control
Ch. 1	Ch. 2	GSM900 Modulation	Pack. Data, << >>, Test M. A	Connect Control
Ch. 1	Ch. 2	GSM900 Spectrum	Pack. Data, << >>, Test M. A	Connect Control
Ch. 1	Ch. 2	GSM900 Receiver Quality	Pack. Data, << >>, BLER	Connect Control

BLER	RLC Blocks	RLC Data Rate	
---	---	---	Slot 0
---	---	---	Slot 1
---	---	---	Slot 2 @ -85.0 dBm
0.00 %	608	6.62 kBit/s	Slot 3 @ -85.0 dBm
0.00 %	608	6.62 kBit/s	Slot 4 @ -85.0 dBm
0.00 %	607	6.62 kBit/s	Slot 5 @ -85.0 dBm
---	---	---	Slot 6 @ -85.0 dBm
---	---	---	Slot 7
0.00 %	1823	19.86 kBit/s	Over all

20.83 kBit/s Long Term Throughput
6.94 kBit/s Long Term Throughput per Slot

Main Slot: **17** (-94 to -93 dBm) C value
4 **0** (0.0 to 0.2 %) RX Quality
0 (0.00 to 0.25 dB) Sign. Var.

GPRS Coding Scheme: CS 1
 Bit Stream: BLER

Repetition | RLC Block Count | BLER | Application | Analyzer Level | MS Signal | BS Signal | Network | Menus

CMU200 3GPP (E)GPRS

优势 – 方便的时隙配置

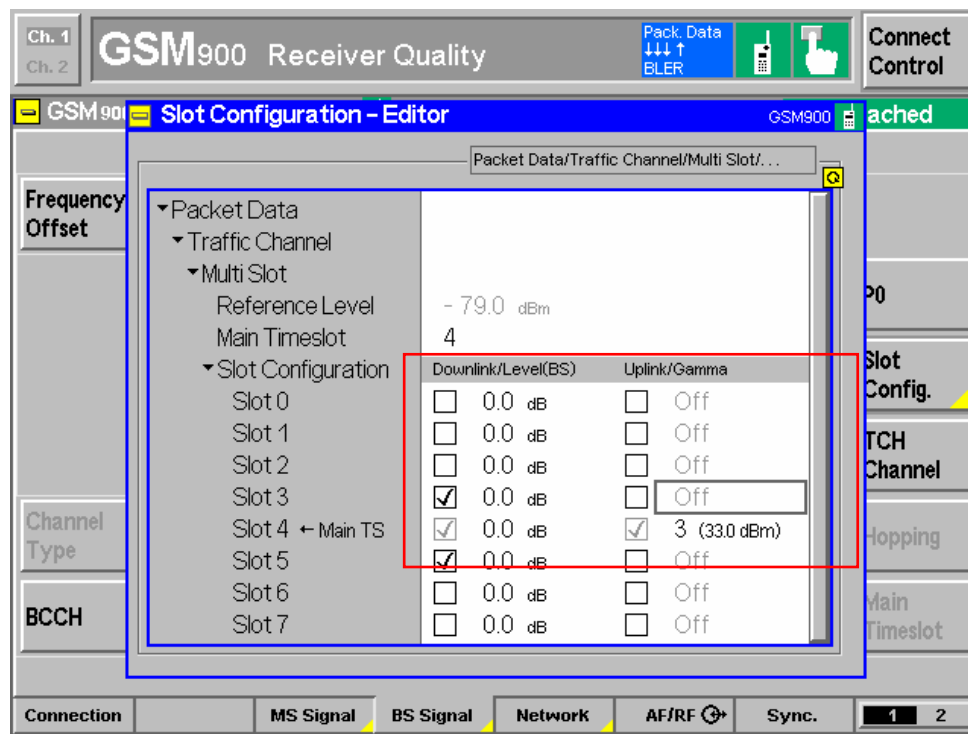


❖ 旧固件特性: 通过来配置时隙

- ❖ 优势: 具有最大的灵活性
- ❖ 劣势: 需要背景知识使用这种灵活性
- ❖ 不允许的情况（在3GPP多时隙表中定义的规则）将导致一个“signaling timeout”，同时TBF无法建立

❖ 新固件特性（3.50）

- ❖ 保持了CMU的灵活性 用于多时隙指定，达到“everything is allowed”
- ❖ 提供 **自动** 引导 用来配置最大允许的时隙数，这个依赖于多时隙的class, 测试模式和技术(GPRS/EGPRS)



CMU200 3GPP (E)GPRS



优势 – 方便的时隙配置

❖ 下面将演示CMU时隙配置的要求:

❖ 在(E)GPRS附着的过程中移动台发射它的多时隙class

❖ CMU “自动时隙配置” 必须被激活

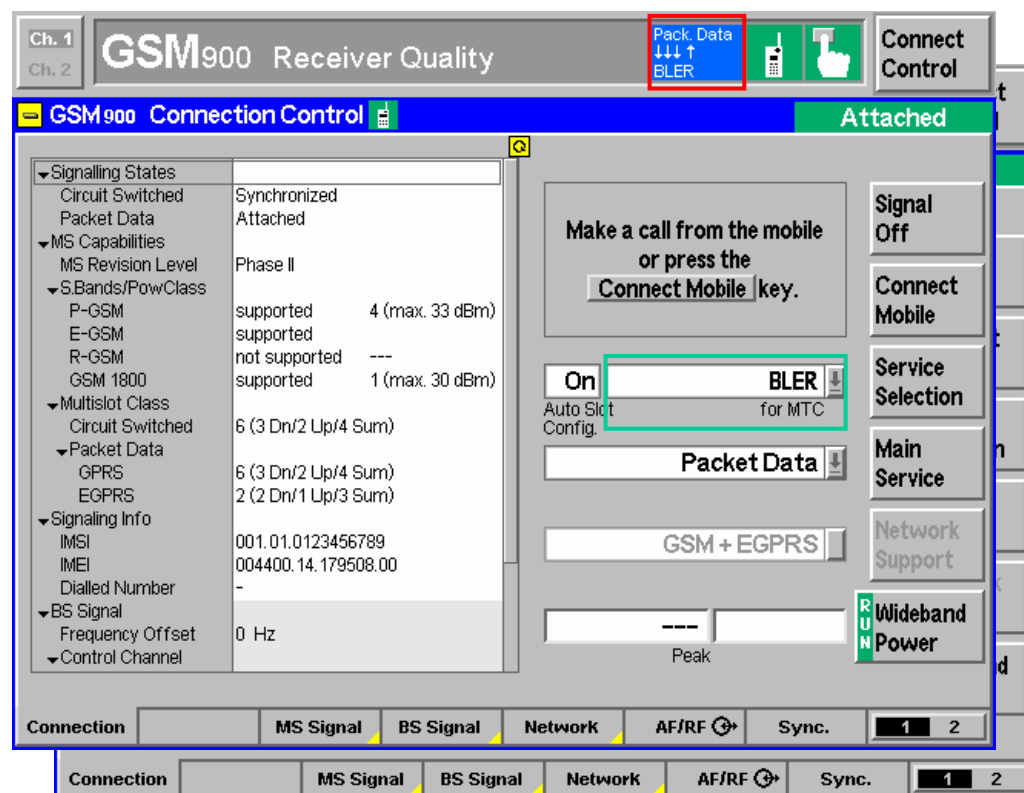
❖ 下面演示CMU如何进行时隙配置

:

❖ 当前 service selection 定义了用于上行和下行的时隙数和位置(BLER作为例子)

❖ CMU设置了允许的最大时隙数(3 DL为接收测试)

❖ 万一在附着的时候没有多时隙class被报告上来, 则会使用一个DL/UL, 它可以适用任何情况



CMU200 3GPP (E)GPRS

优势 – 新特性



❖ 频带内handover (GPRS)

❖ BLER

❖ 用于任何分离的下行链路（GPRS/EGPRS）的数据吞吐量指示器

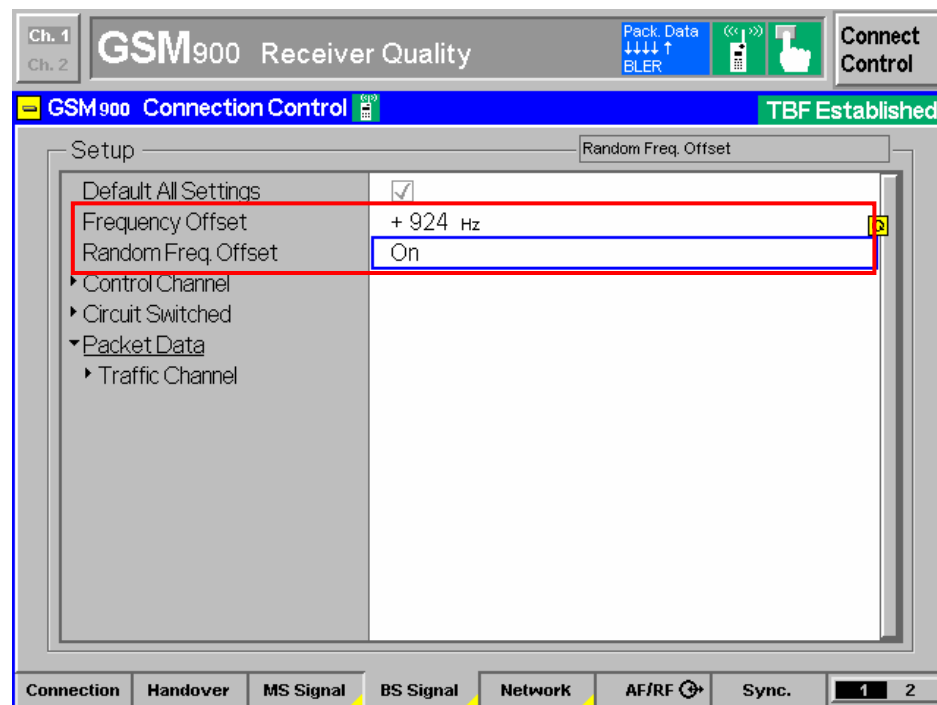
❖ 在BLER测量的时候 (GPRS/EGPRS)
可以同时测量发射参数

❖ 增加的冗余开关 “on/off”(EGPRS)

❖ 任意的频率偏移
(依照 3GPP 45.05 chapter 6.1.2)

❖ CMU从一个突发到另一个

突发以设定的频率偏移进行跳频，
这样可以测试接收机同步的能力



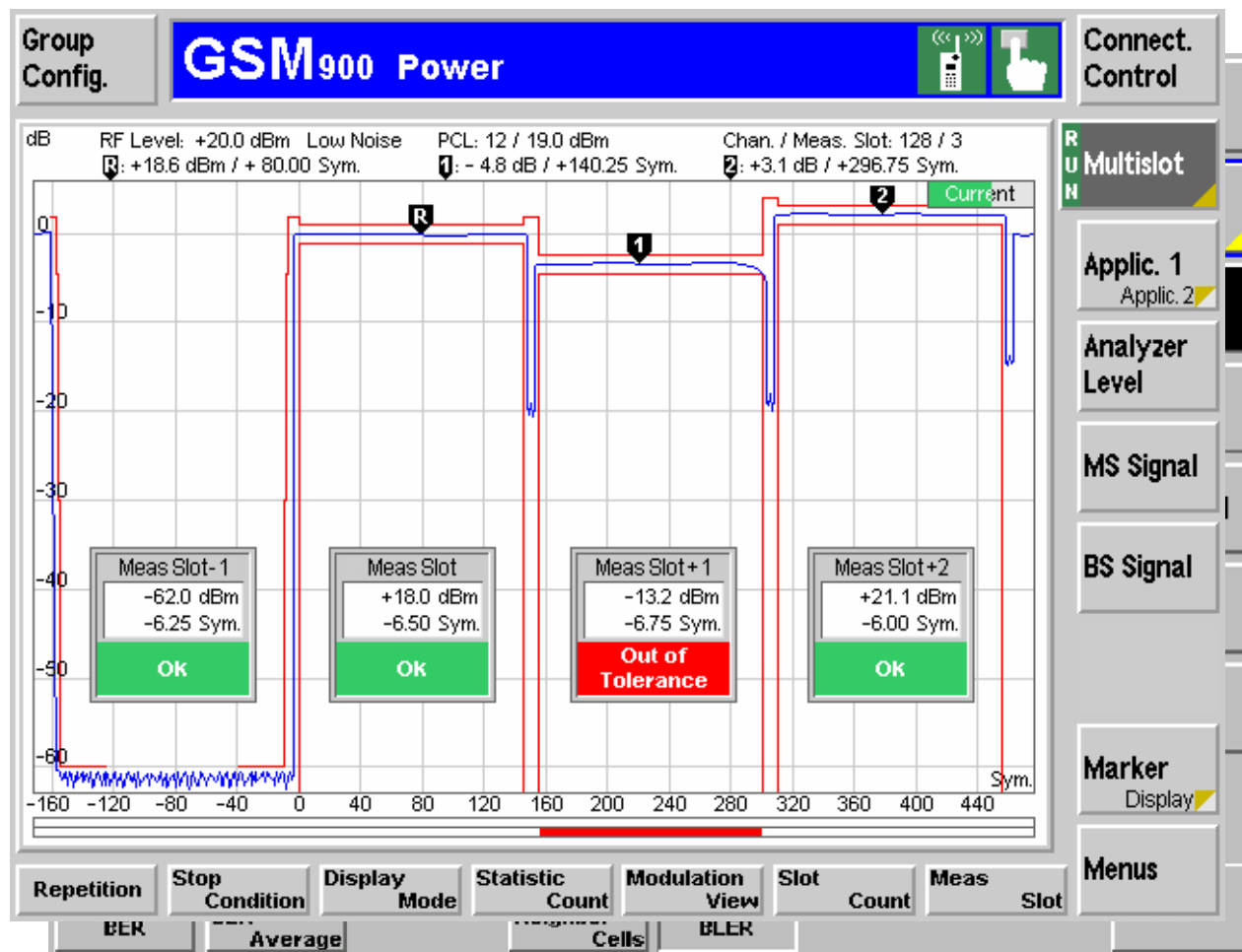
CMU200 3GPP (E)GPRS

优势 – 新特性



❖EGPRS BLER @4DL
(需要 B21v14)

❖(E)GPRS Testmode-A/B
4UL(需要B21v14)



CMU200 3GPP (E)GPRS

优势 – 新特性

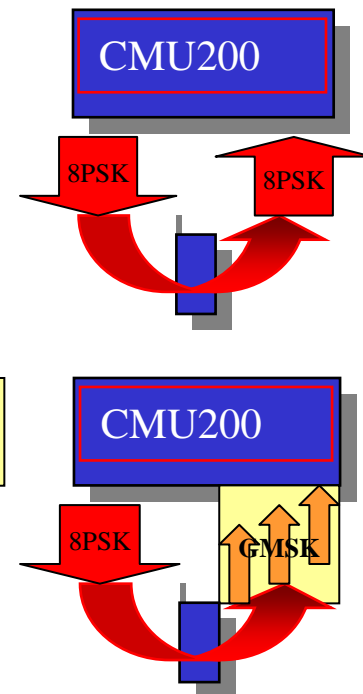


❖ EGPRS 块环回对称/非对称测试模式

3GPP 44.014 测试模式闭合移动台
内部的BER环回用作未编码的
8PSK射频块数据发射

either symmetric (8PSK UL/UL)

or asymmetric (8PSK DL and GMSK UL)
one DL block (8PSK) will be looped over 3 consecutive GMSK UL blocks



❖ Test Mode B 支持EGPRS

3GPP 44.014 测试模式闭合移动台
内部BER环回用于 GPRS (CS1-4) 和
EGPRS (MSC1-9) 编码无线数据块

CMU200 3GPP (E)GPRS

优势 – 新特性



❖ 错误USF检测

- ❖ 错误USF检测测试用来检验移动台不会响应在系统中分配给其他用户的USF。CMU可以产生100%正确的USF（分配给DUT的），也可以产生0%或12.5%正确的USF。
- ❖ 所有的没有被分配的USF值被任意的设置。

Ch. 1 GSM900 Receiver Quality

Main Slot: 4

---	BER
---	USF BLER
---	DBLER
---	CRC Err.
---	False USF Det

100 RLC Data Blocks

Meas. Mode: BER / DBLER
GPRS CS: CS 1
Bit Stream: PRBS 2E9-1
USF D. Cycle: 100% assigned

Main Slot: 4
C value: 0 (less to -110 dBm)
RX Quality: 0 (0.0 to 0.2 %)
Sign. Var.: 0 (0.00 to 0.25 dB)

Settings

- Signalling States
- MS Capabilities
- Signalling Info
 - IMSI: 001.01.0123456789
 - IMEI: 010101.00.129107.04
 - Dialled Number: -
 - Coding Scheme: CS 1
- Meas. Control
 - Stop Condition: None
 - Average: 100 Frames
 - Meas. Mode: BER / DBLER
- Analyzer Level
- BS Signal
 - Packet Data
 - Ind. BER Levels
 - BER Limit Config: 100% assigned

Ch. 1 GSM900 Receiver Quality

Ch. 2 GSM900 Connection Control

Setup

Main Service	Packet Data
Network Identity	
Circuit Switched	
Packet Data	
Coding Scheme	CS 1
Puncturing Scheme	
PC Meas Chan	BCCH
USF	0
USF Duty Cycle	100% assigned
Extend Dyn. Alloc.	Auto
Number of PDUs	4095
Slot Offset	0
Testmode with ACK	Off
RLC Mode (Testmode B)	Unacknowledged
PDP Context Activation	Accept

CMU200 3GPP (E)GPRS

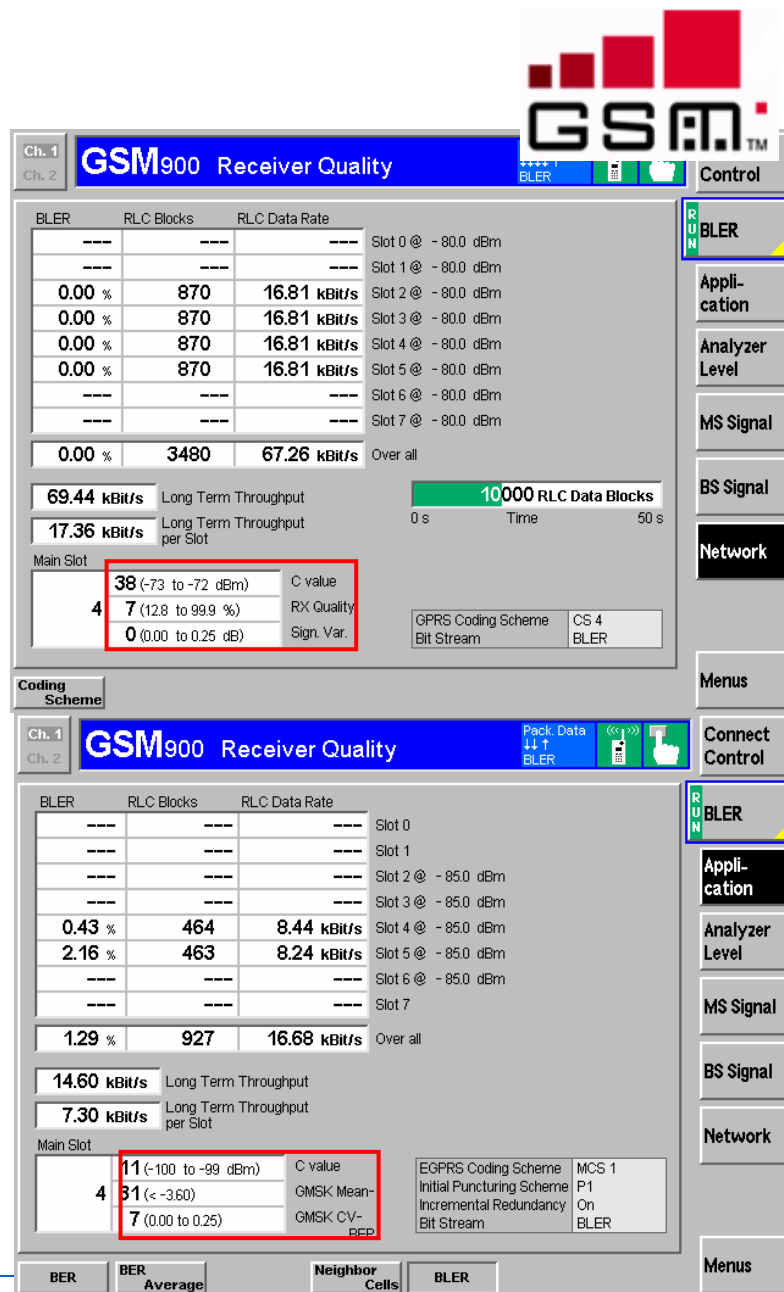
优势 – 新特性

❖ 信道质量报告(GPRS)

- ❖ C_VALUE (GMSK); 在DL上的信号强度
- ❖ RxQual; 在DL上的接收信号质量
- ❖ SIGNAL_VAR; 在DL上的统计信号变化

❖ 信道质量报告(EGPRS-GMSK)

- ❖ C_VALUE (GMSK); 在DL上的信号强度
- ❖ GMSK_MEAN_BEP; 在DL上的平均误码概率
- ❖ GMSK_CV_BEP; 误码概率的变化率



CMU200 3GPP (E)GPRS

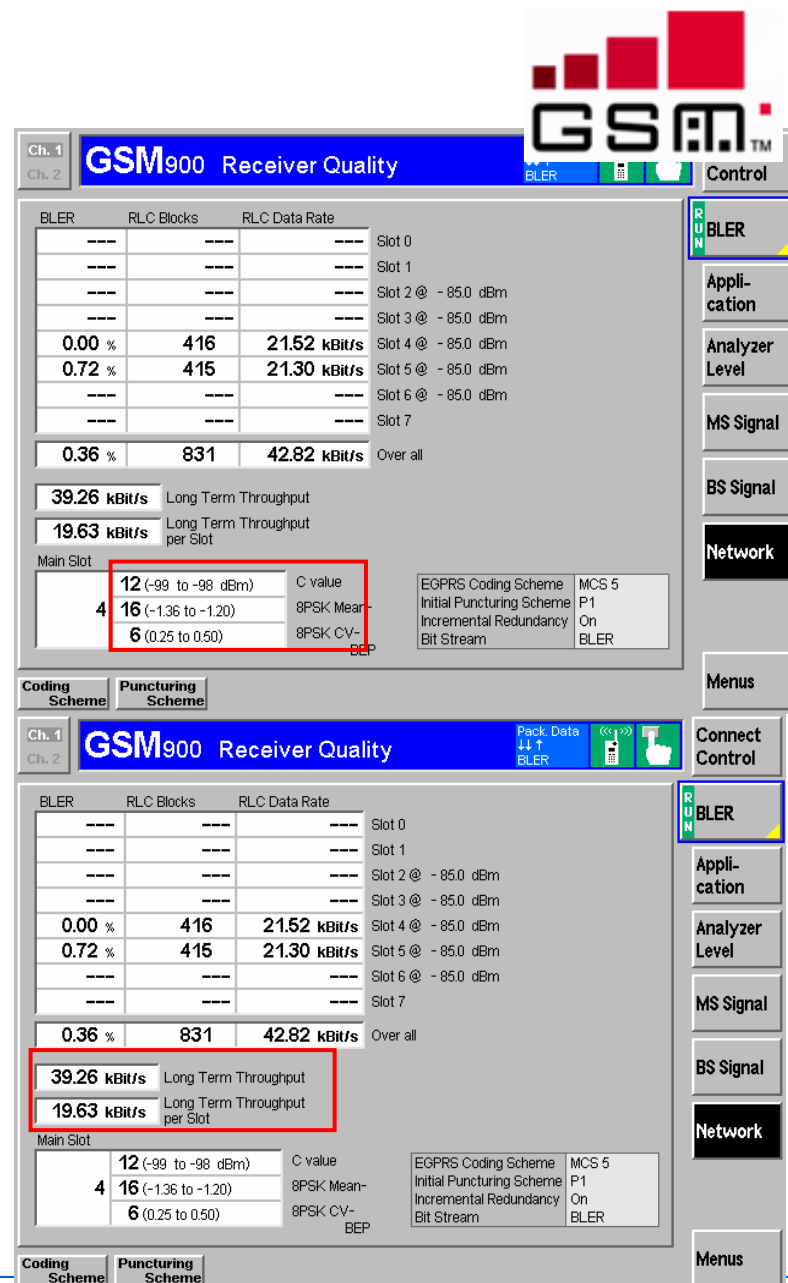
优势 – 新特性

❖ 信道质量报告 (EGPRS-8PSK)

- ❖ C_VALUE (8PSK); 在DL上的信号强度
- ❖ 8PSK_MEAN_BEP; 在DL上的平均误码概率
- ❖ 8PSK_CV_BEP; 误码概率的变化系数

❖ 新增的冗余特性测试(EGPRS)

- ❖ 依据 51.010 chapter 14.18.7
- ❖ 这个测试验证在特定测试条件下每一个时隙上的最小数据吞吐量(长时吞吐量)



CMU200 3GPP (E)GPRS

优势 – AMR



新的 CMU200 AMR 支持GSM/GPRS/EGPRS

- ❖ 所有定义的全速和半速语音编码和信道类型联合
- ❖ 独立的 UL/DL 速率
- ❖ UL带内信令消息的显示
- ❖ BER 测量



CMU200 3GPP (E)GPRS

Layer 3 消息察看器 – CMU-Z49



❖ GSM消息察看器 R&S CMU-Z49是一个用于查看GSM layer3信令消息log文件的评估工具，这个log文件是由CMU200和某个GSMxxx-MS软件包（CMU-K20,...,K24）产生的。GSM消息察看器基于PC消息察看器和CRTU GP01.GSM的Composer平台。



CMU200 3GPP WCDMA

功能



❖ 信令功能

- ❖ 依据3GPP/FDD Release99的信令功能
- ❖ CMU模拟一个 UTRAN 小区
- ❖ UE同步到小区
- ❖ RRC链接建立
- ❖ 呼叫建立 (MOC, MTC)
- ❖ CMU对UE发射进行测量
- ❖ Test Mode / Test Loop (1 or 2)激活命令
- ❖ CMU对UE接收进行测量
- ❖ 呼叫释放 (NIR, MIR)

CMU200 3GPP WCDMA

功能



❖ 当前信令固件的功能:

❖ Tx-测量

- Power
- Modulation
- Spectrum
- Code Domain Power
- Open Loop Power
- Inner Loop Power Control with TPC bits

❖ Testmode and testloop 激活

❖ Rx-测量

- BER, DBLER and BLER
- UE Measurement Report

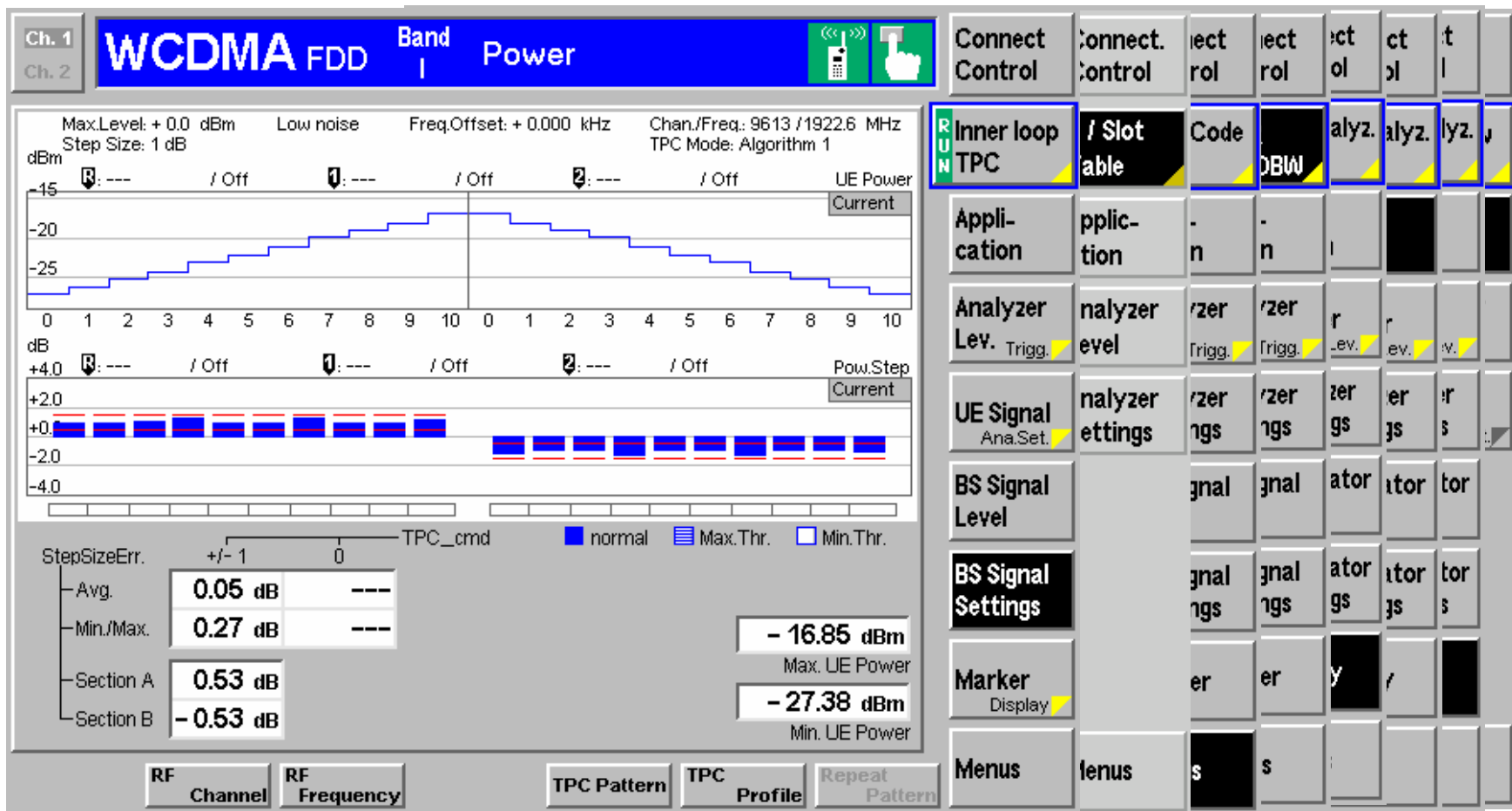
❖ 所支持的 TS34.121 测量

❖ 发射参数 (chapter 5)

- Maximum Output Power (5.2)
- Frequency Error (5.3)
- Inner Loop Power Control in the Uplink (5.4.2)
- Minimum Output Power (5.4.3)
- Transmit Off Power (5.5.1)
- Occupied Bandwidth (5.8)
- Spectrum Emission Mask (5.9)
- Adjacent Channel Leakage Power Ratio (5.10)
- Error Vector Magnitude (5.13.1)
- Peak Code Domain Error (5.13.2)

CMU200 3GPP WCDMA

TX 測量



CMU200 3GPP WCDMA

RX 测量



❖ 所支持的 TS34.121 测量

❖ 接收参数 (chapter 6)

- Reference Sensitivity Level (6.2)
- Maximum Input Level (6.3)

Ch. 1
Ch. 2

WCDMA FDD Band 1 Receiver Quality

0.000 % BER
0.000 % BLER
0.000 % DBLER

0 500 Transp. Blocks Continuous
0 Lost Transp. Blocks

Settings

- Connection Info
 - Dedicated Chn. Type RMC
 - SRB 2.5 kbit/s
 - Reference Channel Ty 12.2 kbps
 - Test Mode Loop Mode 2
- BER
 - Meas. Control
 - Repetition Continuous
 - Stop Condition None
 - Trp. Blk Continuous 500
 - Trp. Blk SingleShot 100
 - Transp. BlockSize symmetric
 - Limits
 - BER + 0.100 %
 - BLER + 1.000 %
 - DBLER + 1.000 %

Connect Control
RUN
BER
Application
Analyzer Level
UE Signal Ana.Set.
BS Signal Level
BS Signal Settings
Menus

Power Modulation Spectrum Code Dom. Power Receiver Quality

CMU200 3GPP WCDMA

支持的测试环回



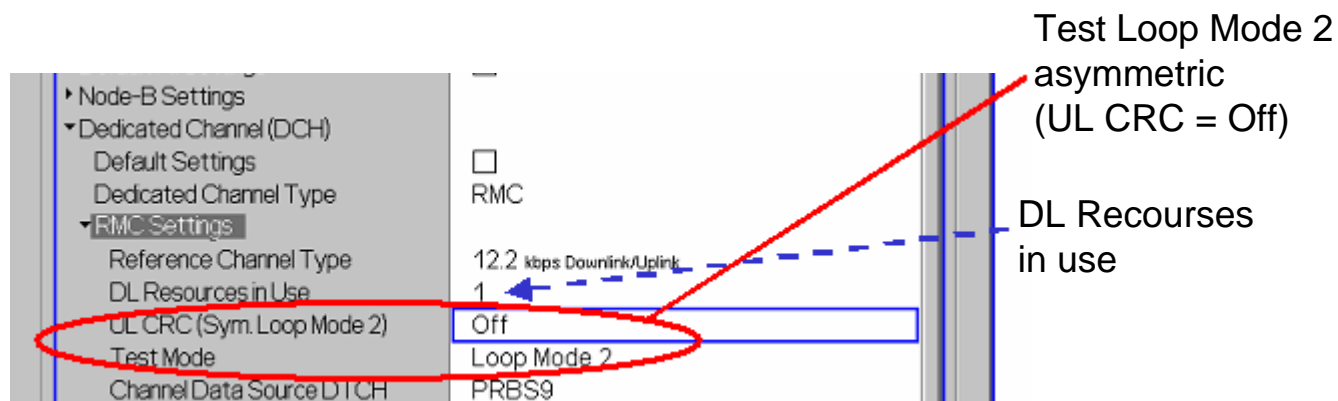
❖ 在TS34.109定义的测试环回

❖ Test Loop Mode 1

- CMU200支持具有透明RLC（发射模式TM）的BER测试

❖ Test Loop Mode 2

- CMU200支持对称的DL和UL传输的BER测试
- CMU200支持非对称的最大UL数据块的BER和BLER测试。

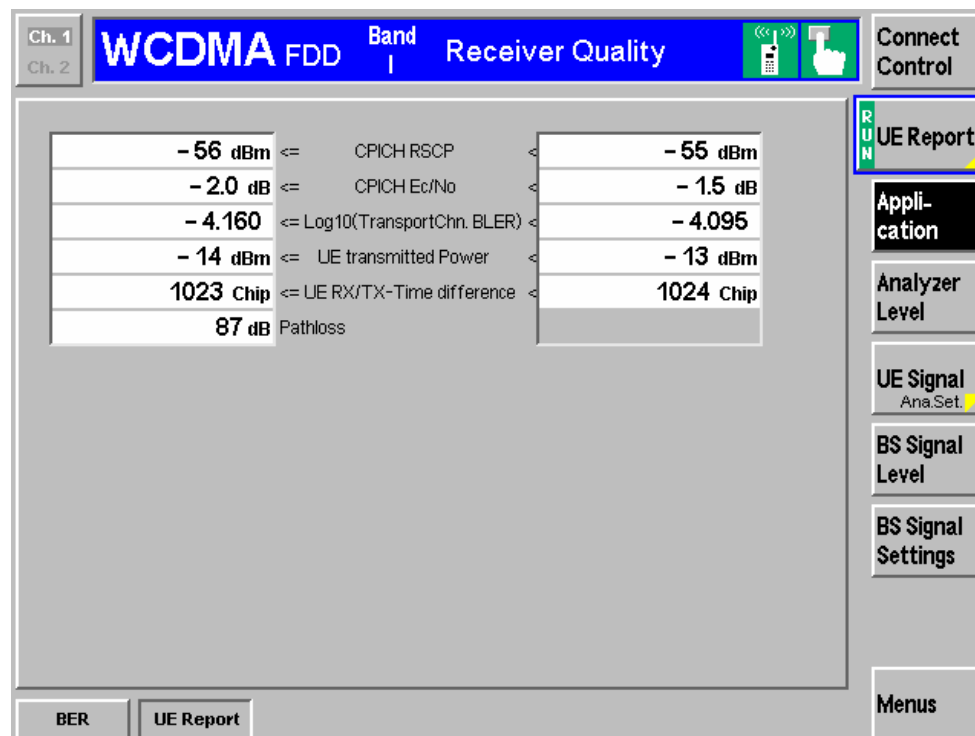


❖ UE 测量报告

❖ 汇报UE接收测量的结果

❖ 循环汇报的结果

- CPICH RSCP
(UE 在 CPICH上的功率测量)
- CPICH Ec/No
(UE在CPICH上的S/N测量)
- 传输信道 BLER
(UE在DPCH上的BLER测量)
- UE 发射功率
- UE Rx/Tx 时间误差
- 路径损耗
(相对于报告的P-CPICH功率
[参看UE菜单的开环设置])



The screenshot displays the 'WCDMA FDD Receiver Quality' report. The interface includes a top status bar with 'Ch. 1', 'Ch. 2', 'WCDMA FDD', 'Band 1', and 'Receiver Quality'. A central table lists various metrics with their values and units. On the right side, there is a vertical menu with options like 'UE Report', 'Application', 'Analyzer Level', 'UE Signal Ana.Set.', 'BS Signal Level', 'BS Signal Settings', and 'Menus'. At the bottom, there are buttons for 'BER' and 'UE Report'.

-56 dBm	<=	CPICH RSCP	<	-55 dBm
-2.0 dB	<=	CPICH Ec/No	<	-1.5 dB
-4.160	<=	Log10(TransportChn. BLER)	<	-4.095
-14 dBm	<=	UE transmitted Power	<	-13 dBm
1023 Chip	<=	UE RX/TX-Time difference	<	1024 Chip
87 dB		Pathloss		

❖ 鉴权和安全

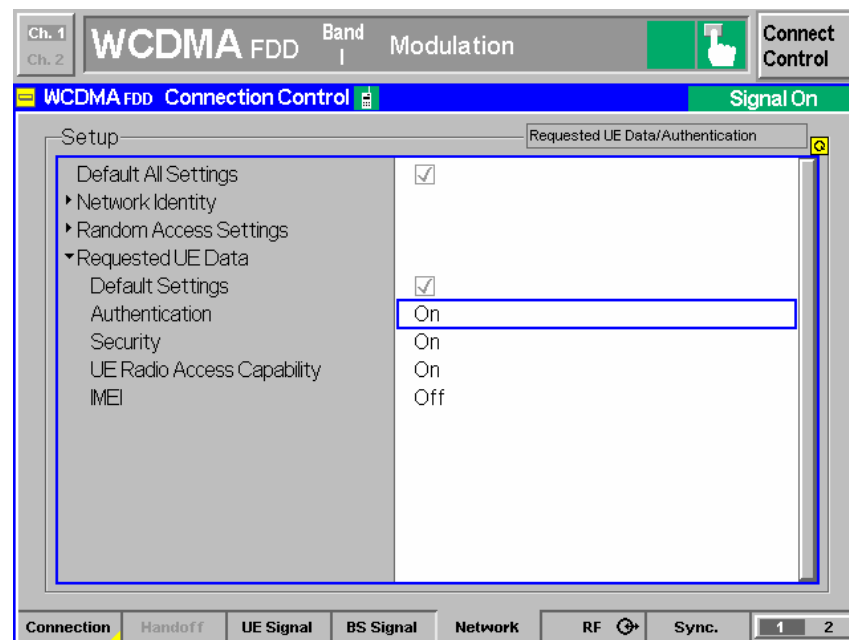
❖ 鉴权

- Triggered by network
- Key exchange for integrity (and ciphering)

❖ 安全

- In CMU200 only Integrity
- No Ciphering

❖ 对于这两个过程需要一个USIM卡!



CMU200 3GPP WCDMA

测试卡 USIM



❖ 作为附件的测试卡 USIM

- ❖ 测试卡USIM 用于“Integrity” 算法
- ❖ Integrity 密钥在几月前刚指定
- ❖ 测试卡USIM中的IMSI在3GPP中被指定
- ❖ 测试卡USIM也用于接收质量测试
- ❖ R&S测试卡USIM也支持3G UE的2G/2.5G模式

❖ Option CRT-Z3



CMU200 3GPP WCDMA

handover



❖ Handover 从 GSM 到 WCDMA

- ❖ 目前不太重要。
- ❖ 市场上的UE目前只支持WCDMA到GSM的切换。
- ❖ 对于从GSM到WCDMA的Handover，需要一个WCDMA的小区可以GSM小区同时存在。



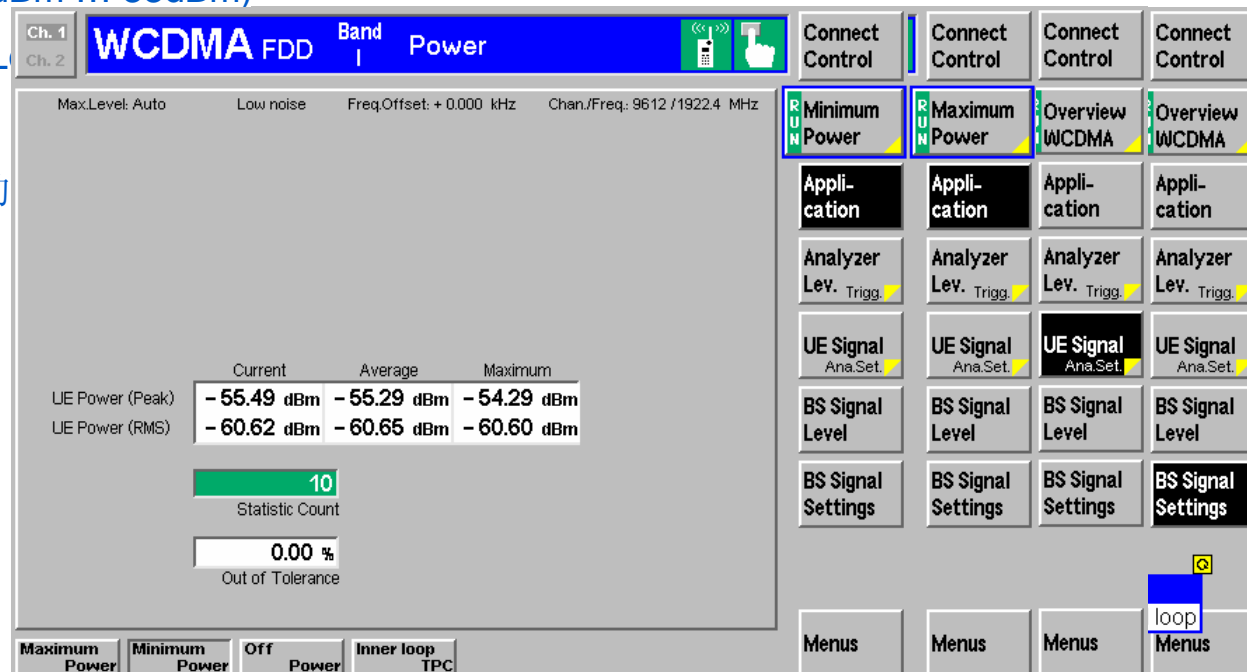
CMU200 3GPP WCDMA

功率测量



❖ 功率测量

- ❖ 上行目标功率 Target Power
- ❖ UE发射功率的便捷控制 Easy control of UE transmit power
- ❖ 控制范围从最小到最大 (-50dBm ... 33dBm)
- ❖ TPC Pattern 类型 “Closed Loop”
- ❖ 最大 / 最小功率
- ❖ UE发射功率到最大或最小的



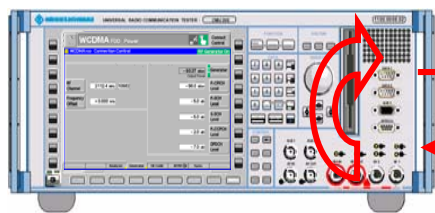
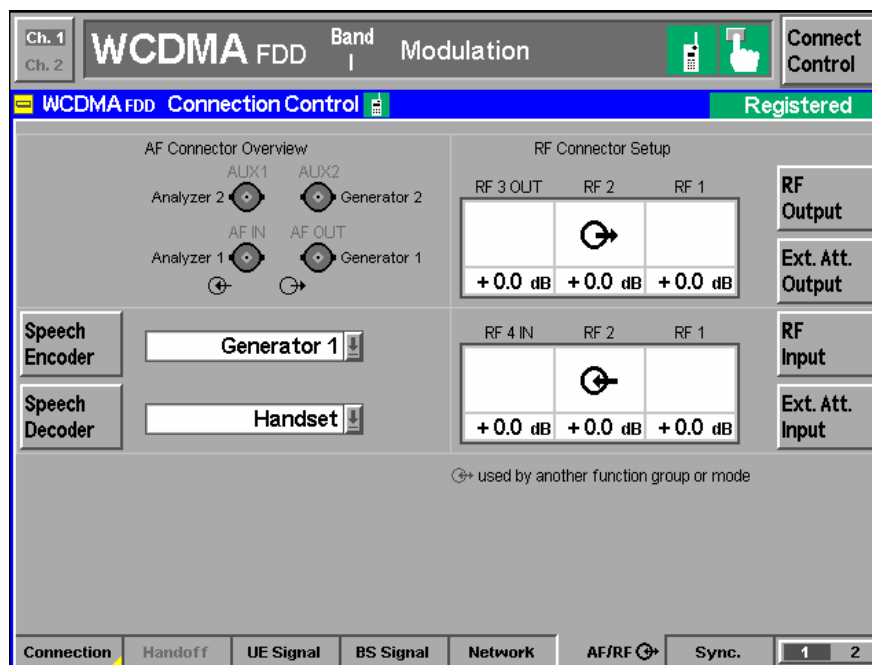
CMU200 3GPP WCDMA

语音环回和AMR编解码器



❖ 由于具有AMR语音编解码器，从而可以进行WCDMA的语音测量

❖ RAB用于AMR，使用了语音环回模式



Audio loopback in CMU

RF link



Speech Data In and Out
Audio measurements

CMU200 3GPP WCDMA

消息纪录和分析器



❖ CMU200的新产品(CMU-Z46):

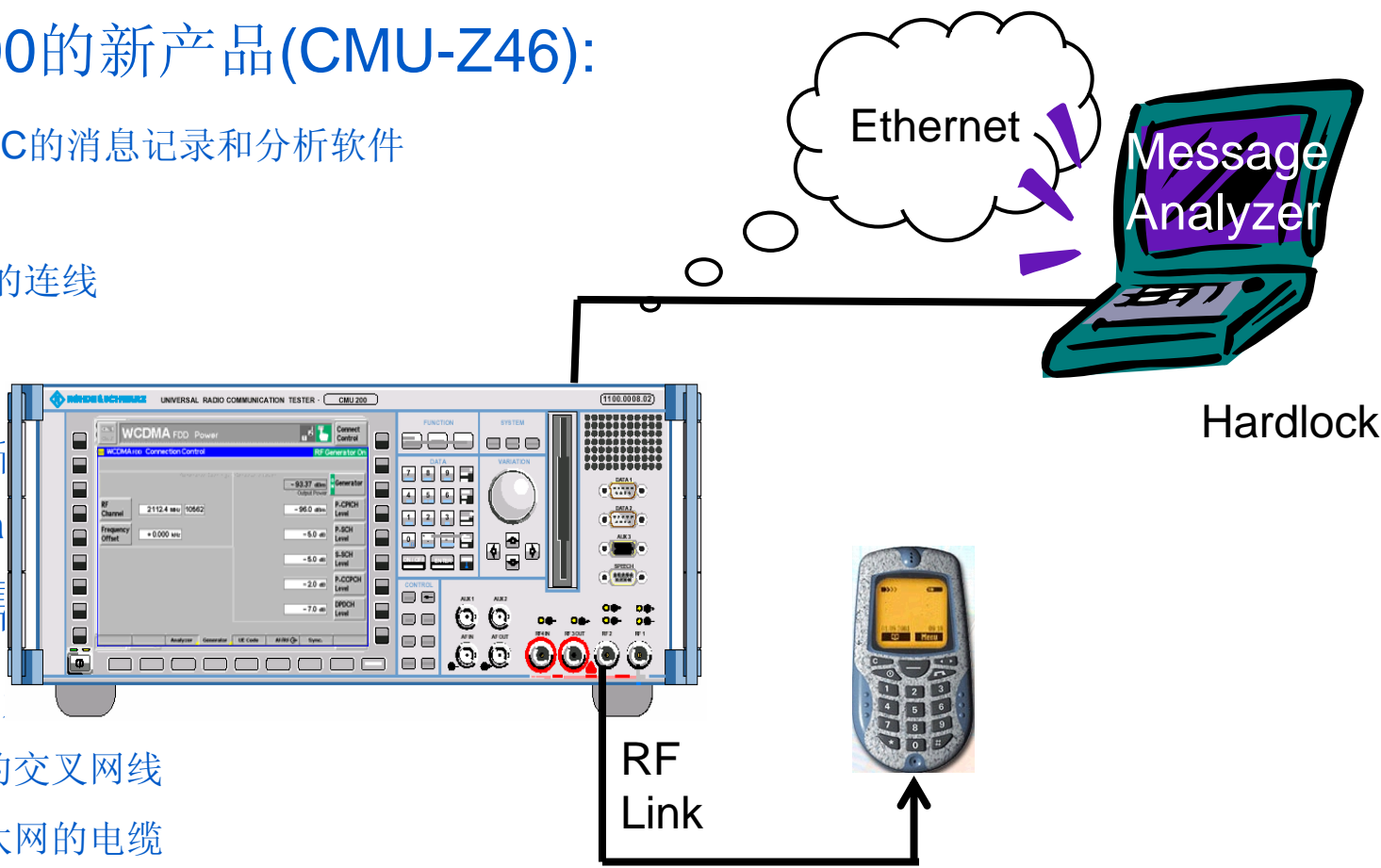
- ❖ 用于外接PC的消息记录和分析软件
- ❖ 硬件狗
- ❖ CMU内部的连线

❖ 功能

- ❖ 记录和分析
- ❖ 消息覆盖la

❖ 客户端需

- ❖ PC, 系统
- ❖ 用于直连的交叉网线
- ❖ 或通过以太网的电缆



CMU200 3GPP2



- Voice
- Data up to 14.4 kbps

- Voice
- Data up to 115 kbps

- 2x increases in voice capacity
- Up to 307 kbps* packet data on a single (1.25 MHz) carrier
- First 3G system for any technology worldwide

- Optimized, very high-speed data (Phase 1)
- Up to 2.4 Mbps packet data on a single carrier (Phase 1)
- Integrated voice and data (Phase 2); up to 3.09 Mbps

CMU200 3GPP2

CDMA2000 1x / 特性



❖ Non Signaling

- ❖ 信号发生器 / 信号分析仪

❖ Signaling

- ❖ Loopback Service options SO2, 9, 55
- ❖ Test Data Service option SO32
- ❖ Speech service options 1, 3, 17, 0x8000
- ❖ Service option SO6 (短消息), BS to MS
- ❖ **Service option 33** (端对端数据连接)
- ❖ Radio Configurations RC1-5 (Fwd), RC1-4 (Rev)
- ❖ **Support for 153.6 / 230.4 kbps data rates in F-SCH**
- ❖ Quick Paging Channel
- ❖ Handoffs
 - Implicit Handoffs: RF Channel, PN Offset, Frame Offset, Walsh Codes, QOF
 - AMPS, Interband Handoff, CDMA2000 - IS95
- ❖ Trigger Signals (PowerControl, Sync, Paging, SuperFrame, 2PPS)
- ❖ **Turbo Coding**
- ❖ 功率控制比特的步长可以设置
- ❖ 功率控制比特序列可以设置

CMU200 3GPP2

CDMA2000 1x / 测量功能



❖ 功率

- ❖ Min/Max Output Power O-QPSK, H-PSK
- ❖ Gated Output Power (RC1/2)
- ❖ Open Loop Time Response
- ❖ Standby/Access-Probe Power

❖ 调制

- ❖ O-QPSK / H-PSK: Overview, EVM, Magnitude Error, Phase Error

❖ 频谱

- ❖ 30kHz Spectrum Analyzer Filter @ 4 frequency offsets (user configurable)
- ❖ Max. Frequency Offset 2MHz

❖ 码域功率

- ❖ CDP (Code Domain Power)
- ❖ PCDEP (Peak Code Domain Error Power)
- ❖ Channel Power

CMU200 3GPP2

CDMA2000 1x / 测量功能



❖ 接收质量

- ❖ FER on FCH
- ❖ FER on SCH0 AND SCH1 - Test Data Service Option (SO32)
- ❖ **Forward Power Control Verification, 前向功率控制检验**
- ❖ FER injection

❖ 语音

- ❖ **Speech Coder (8K, 8K EVRC, 13K), 语音编解码器**
- ❖ Analyzer, Generator

❖ 芯片校准

- ❖ 特定的 AM 调制用于IM2 性能验证
- ❖ Power vs. frame 测量

CMU200 gpsOne application

gpsOne触发输出 CMU-U80



❖ gpsOne MS RF 研发测试

- ❖ AGC 检查
- ❖ 错误警报检测测试
- ❖ C/N0 校准和Doppler估算测试
- ❖ gpsOne灵敏度测试
- ❖ CDMA-GPS隔离测试

❖ 移动台校准测试

**Mobile Standalone Procedures
for GPS RF Testing and
Mobile Station Time Calibration
Application Note**

CL93-V2244-1 X2

December 7, 2000



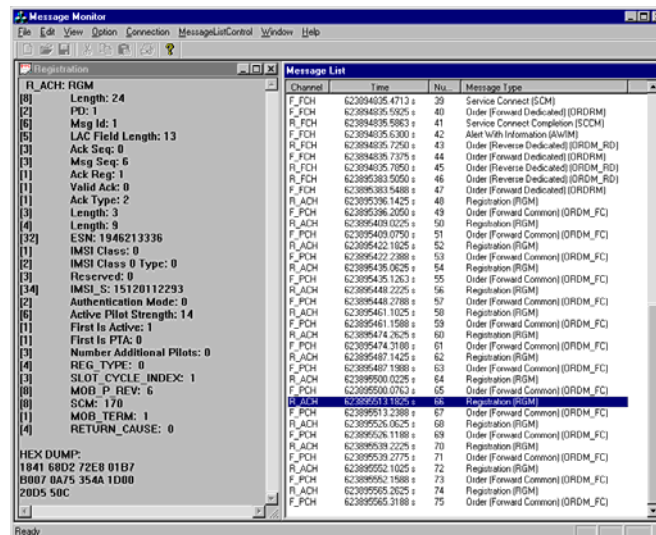
CMU200 3GPP2

CDMA2000 1x / CMU-B87, B85



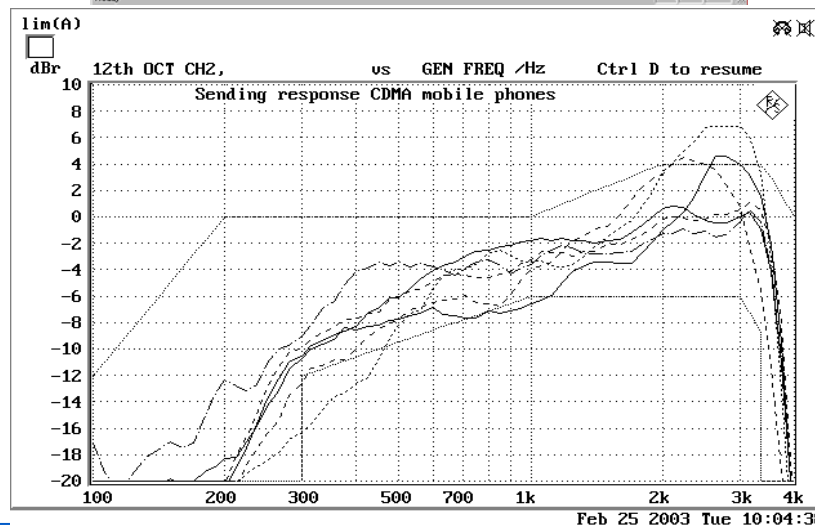
❖ CMU-B87

❖ 这是一个消息监视选件，用来捕捉，解释和显示CDMA前向和反向链路消息，这个消息来源于CMU200和移动台。(layer 3).



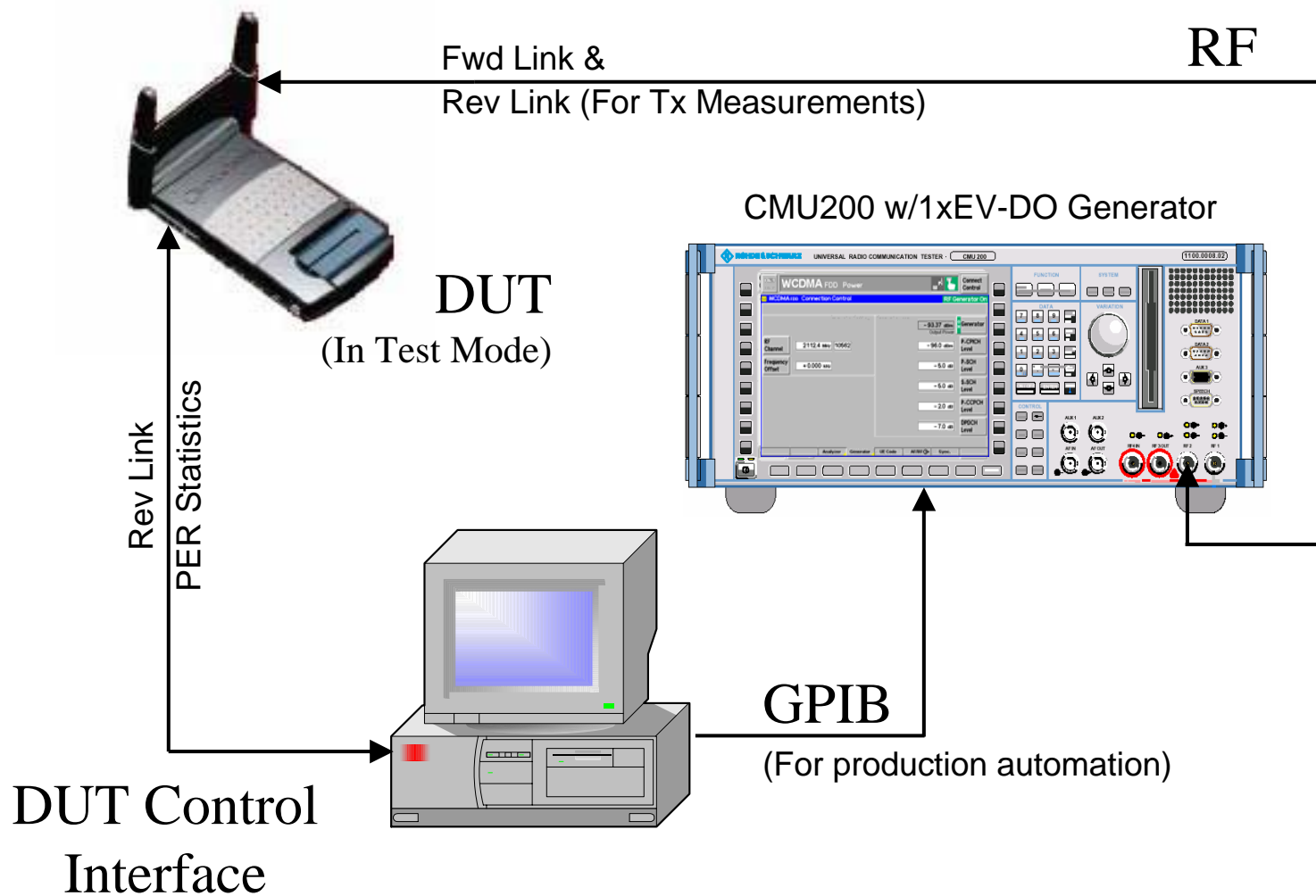
❖ CMU-B85

❖ 8k/13k QCELP, 8k EVRC 语音边界码器用于CDMA2000信令模式



CMU200 3GPP2

1xEV-DO / 典型测试建立



CMU200 3GPP2

1xEV-DO / FTM



❖ 工厂测试模式 (Factory Test Mode)

- ❖ 不需要完整的信令，就可以对DUT进行直接的控制
- ❖ 已经存在于事实上所有的(基于Qualcomm芯片) 1xEV-DO 设计中
- ❖ Qualcomm和R&S协同工作，从而发展出1xEV-DO的FTM概念
- ❖ 通过1xEV-DO 终端上的串行诊断监视接口来实现

❖ 工厂测试模式的工作

- ❖ 最小化测试配置时间
- ❖ 在多个测试项目之间最小化转换时间
- ❖ 允许DUT进行同时测量（在特定环境下）
- ❖ 允许DUT收集前向链路的统计值

CMU200 3GPP2

1xEV-DO / 测试方案



❖ 发射测试

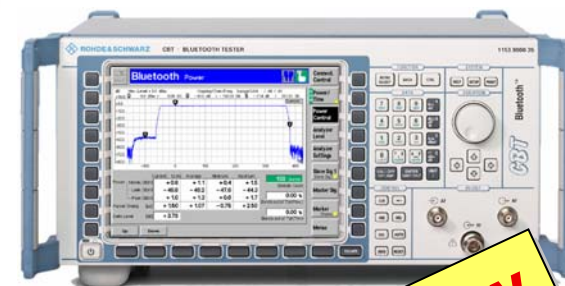
- ❖ 一般的功率测量 (例如 fast power phasing)
- ❖ 码域功率
 - CP / CDEP
- ❖ 调制测量
 - EVM, ME, PE, FE, IQ Analyzer
- ❖ 频谱测量
 - 30khz spectrum analyzer filter @ 4 frequency offset (user configurable)
 - Max. frequency offset 2Mhz

❖ 接收测量

- ❖ 通过测试控制器的DUT控制接口，使用CMU200的射频信号
- ❖ 最多4个终端的数据可以被CMU200并行产生

CMU200 Bluetooth

CMU-B53, CBT, CBT32



New

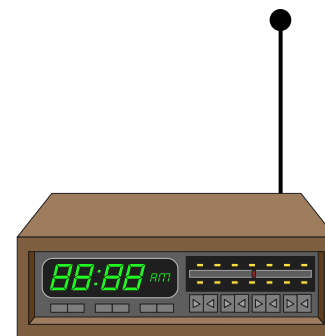
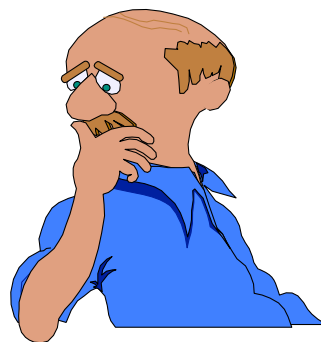
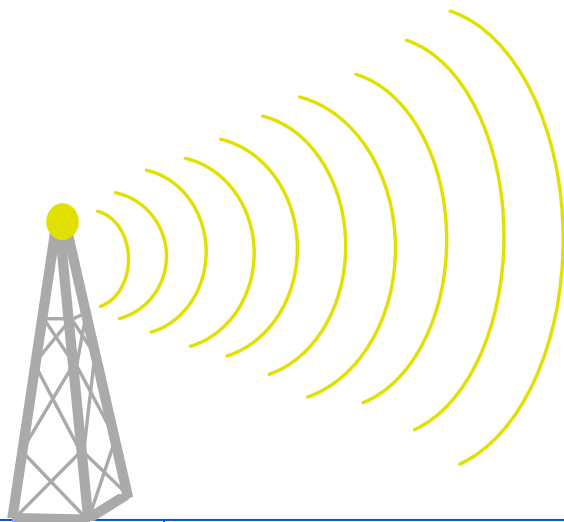
测试目标

发射机

- 输出功率 TRM/CA/01/C
- 功率密度 TRM/CA/02/C
- 功率控制 TRM/CA/03/C
- 发射输出频谱(3) TRM/CA/04,05,06/C
- 调制参数 TRM/CA/07/C
- 初始载波频率容限 TRM/CA/08/C
- 载波频率drift TRM/CA/09/C
- 带外杂散 TRC/CA/01/C

接收机

- ❖ 灵敏度 - 单时隙数据包 RCV/CA/01/C
- ❖ 灵敏度 - 多时隙数据包 RCV/CA/02/C
- ❖ C/I 性能 RCV/CA/03/C
- ❖ 阻塞 RCV/CA/04/C
- ❖ 交调 RCV/CA/05/C
- ❖ 最大输入电平 RCV/CA/06/C

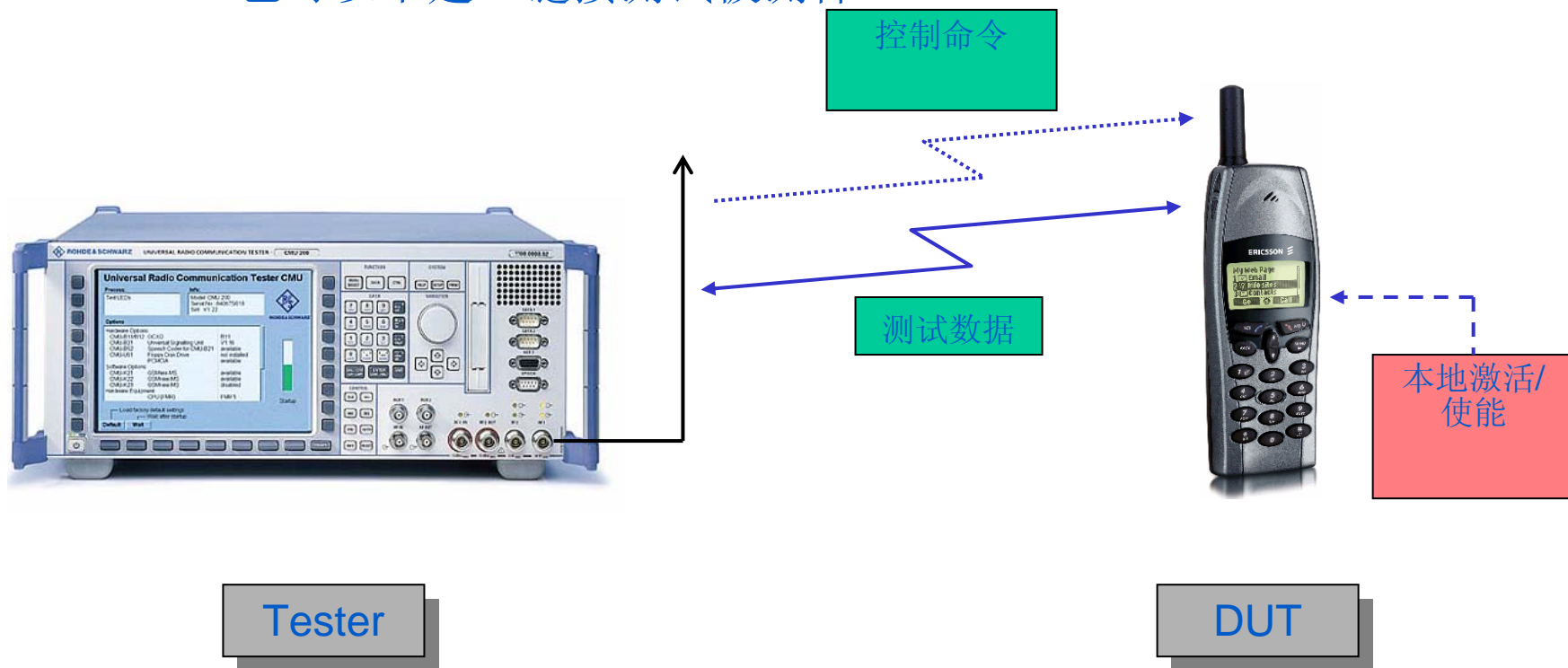


CMU200 Bluetooth



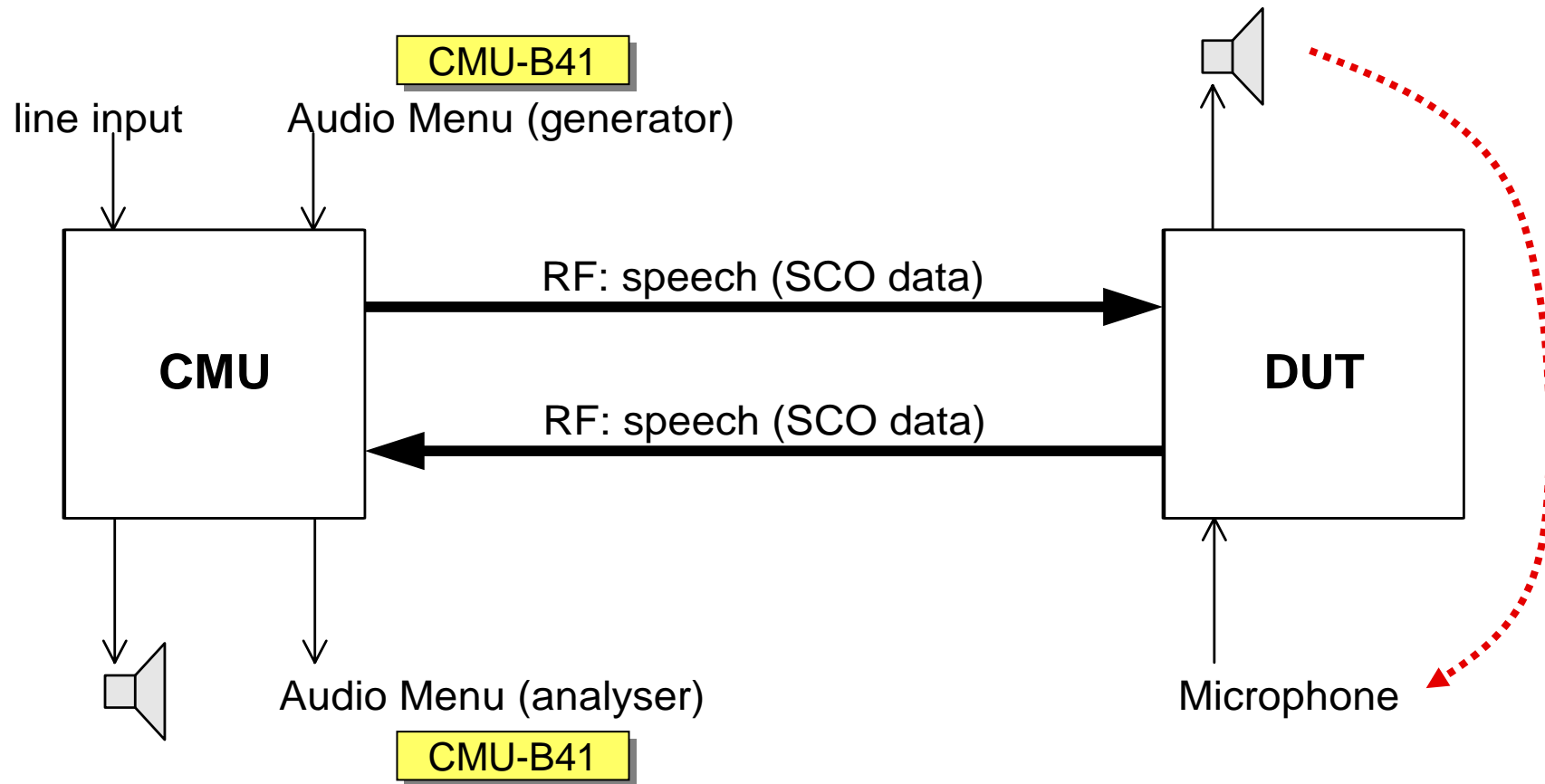
Test Mode / 正常模式

- ❖ CMU200能在test-mode下连接被测件
- ❖ CMU200能在正常模式下连接被测件
- ❖ CMU200也可以不建立链接测试被测件



CMU200 Bluetooth

音频测试



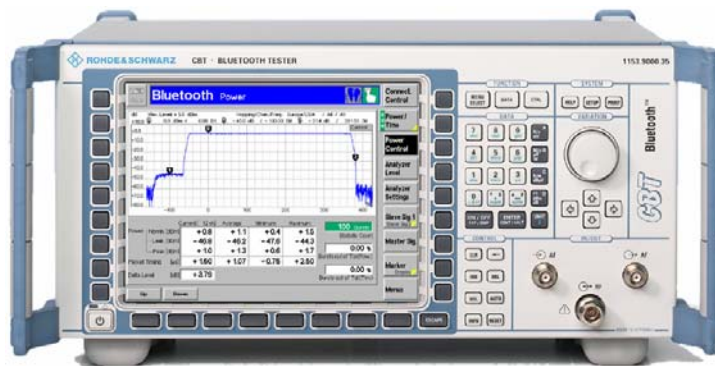
CMU200 Bluetooth's 系列产品



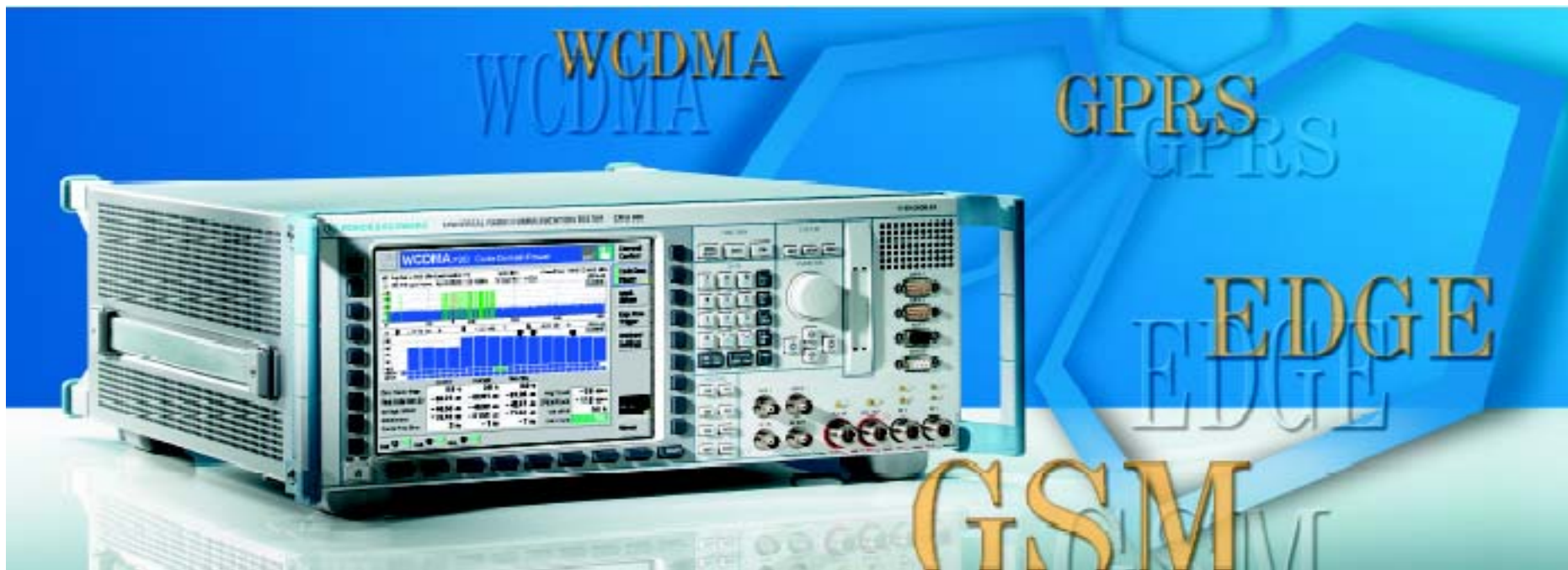
❖ CBT and CBT32

- ❖ 同CMU具有相同的显示和前面板按钮
- ❖ 同CMU-Bluetooth使用一样的软件
- ❖ CBT更小，更轻，更便宜
- ❖ 简化版系统用于生产和检验
- ❖ 大部分测试功能同CMU一样
- ❖ 可以执行完整的dirty发射

New



用于移动台测试的无线通信测试仪: R&S™
CMU300
for GSM / GPRS / EDGE / WCDMA (new!)



Status 10/ 2003, CMU300 SW version V3.22

CMU300 Base Unit

❖ RF 信号发生器

- 频率范围: 10 MHz to 2.7 GHz
- 输出频率精度: 0.6 dB (up to 2.2 GHz)

❖ 频谱分析仪

- 频率范围: 10 MHz to 2.7 GHz
- 具备“Zero Span Mode”

❖ 功率计

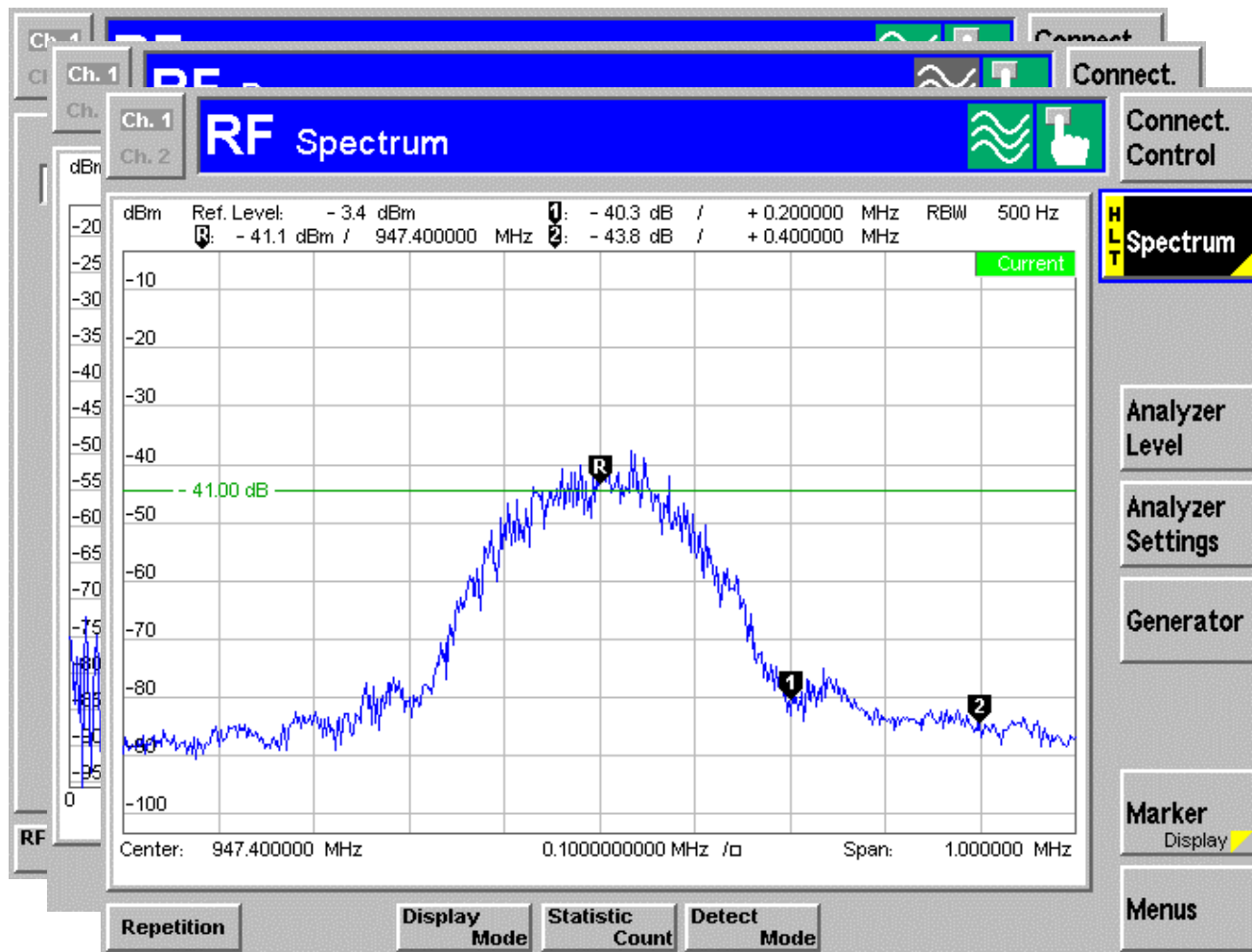
- 测量精度 : 0.5 dB (up to 2.2 GHz)
- 选择性: 10 Hz to 1MHz

❖ 灵活的RF接口

- 前面板4个“N”接头
 - RF 1 双工口 (out -130...-27 dBm; in +6...+47 dBm)
 - RF 2 双工口 (out -130...-10 dBm; in -8...+33 dBm)
 - RF 3 高功率输出 -90...+13 dBm
 - RF 4 高灵敏度输入 -80...0 dBm
- 组合任意的输入和输出
- VSWR好于 1.2 (up to 2.2 GHz)
- 外部衰减可以手工设置, 并被自动计算

CMU300 Base Unit

- ❖ 信号发生器 / 信号分析仪
- ❖ 功率计
- ❖ 频谱分析仪



CMU300 GSM/(E)GPRS



概要

❖ 测量模式:

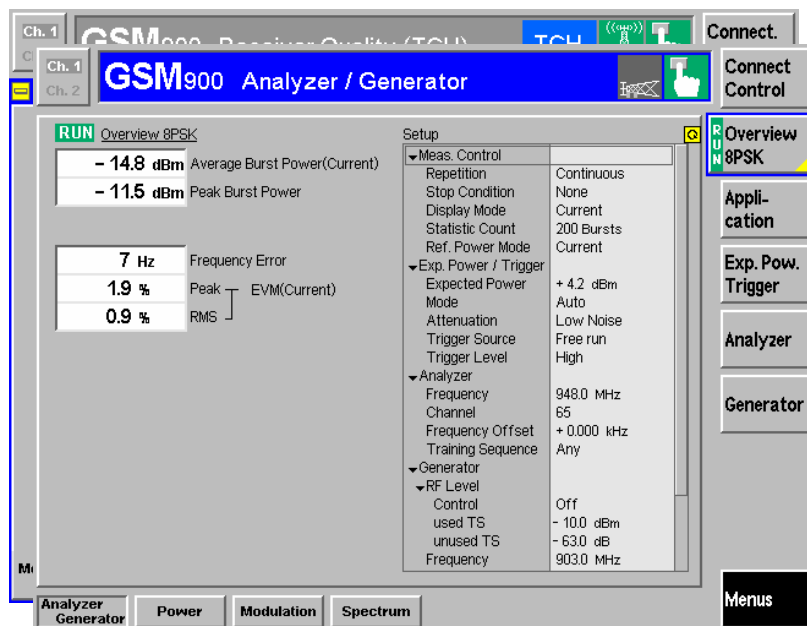
- ❖ Non-signalling 模式: TX测试和UL信号发生 (没有信道编码)
- ❖ Signalling 模式: 同步的TX测试和用于RX BER测试的UL信号发生 (有信道编码)
- ❖ 测试依照规范 3GPP TS 51.021

❖ 配置:

- ❖ Options CMU-B21 (HW) 和 CMU-K30....34 (SW) 是必需的
- ❖ 在仪表中有下行 (DL) 信号分析仪和 上行 (UL) 信号发生器

CMU300 GSM/(E)GPRS

Non-Signaling mode



描述:

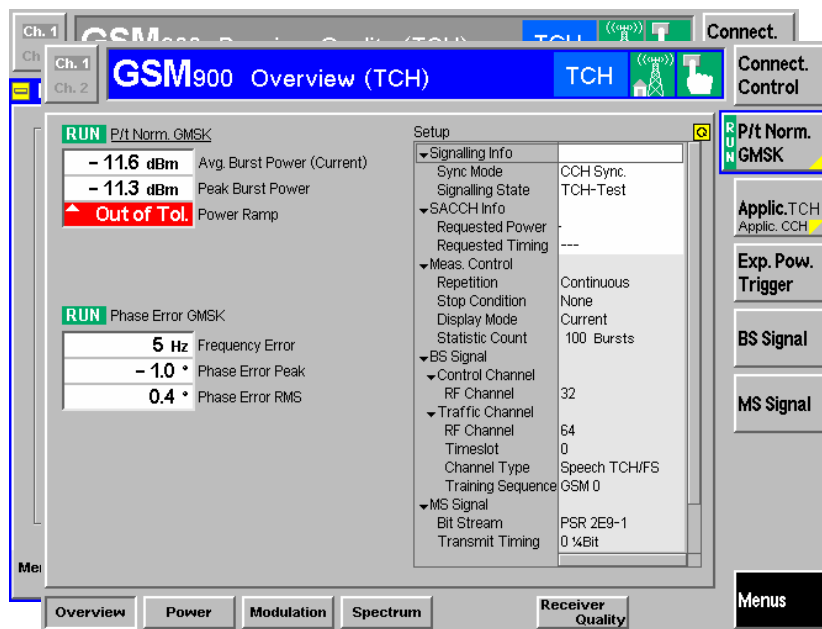
- 仪表执行GMSK/EDGE发射测试，同时提供了DL发射机的功能
- 两个功能没有关联
- 仪表靠输入的RF功率触发。它不会同步到DUT的时间上去

应用:

- ❖ 这种测量模式可以被用作GSM/EDGE模块的测量，而不需要信令的底层参与
- ❖ 主要的发射测试都可以完成
- ❖ 发生器功能可以用作DUT的激励源

CMU300 GSM/(E)GPRS

Signaling mode



描述:

仪表 同步到BTS的TDMA帧时间上.

可能的同步方法:

•“CCH. Sync.” 通过RF连接（BCCH包含系统信息1...4必须被激活）

•“Wired Sync.”（需要从BTS来的26-复帧时钟）

优势:

- ❖ 建立测试容易(只需要RF连结)
- ❖ 可以进行时隙选择的TX测量
- ❖ signaling 模式是进行BER测试的前提条件
- ❖ signaling 模式 提供了实时的DL/UL信号和分析，作为信令过程处理和跳频的前提
- ❖ 这个模式用来测量支持实时编码的TRX单元

CMU300 GSM/(E)GPRS

“CCH” 发射测试



❖ 功率测量:

- ❖ Burst power (average / peak)

❖ 调制分析 GMSK:

- ❖ Phase error (peak / RMS)
- ❖ Frequency error

❖ 频谱测量:

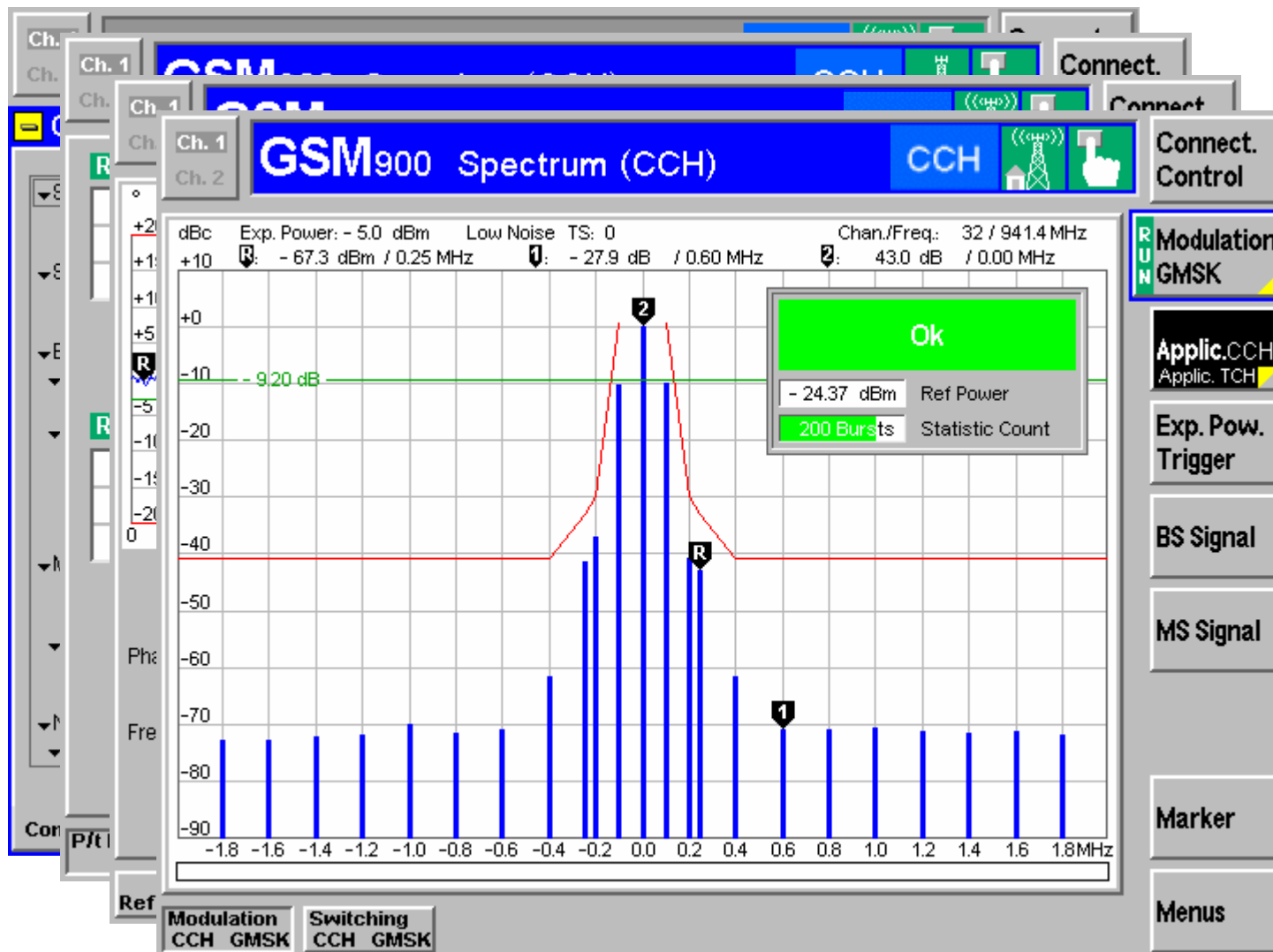
- ❖ Spectrum due to modulation
- ❖ Spectrum due to transient

❖ 附加特性:

- ❖ CCH信息指示 (帧时间, 网络数据)

CMU300 GSM/(E)GPRS

“CCH” 发射测试



CMU300 GSM/(E)GPRS



“TCH” 发射测试

❖ 功率测量:

- ❖ Burst power (average / peak)
- ❖ Power ver. Time (power ramp)
 - “Power versus slot” measurement
 - “Power versus multislot” measurement

❖ 调制测量:

❖ GMSK:

- Phase error (peak / RMS)
- Frequency error

❖ 频谱测量:

- ❖ Spectrum due to modulation
- ❖ Switching transient spectrum

❖ 附加特性 :

- ❖ 可以进行时隙选择测量
- ❖ SACCH信息指示 (需要的功率, 需要的时间)

❖ 8PSK:

- EVM = Error Vector Magnitude (Peak / RMS)
- Magnitude error (peak / RMS)
- Phase error (peak / RMS)
- Origin offset
- Frequency error
- 95 percentile



CMU300 GSM/(E)GPRS

“TCH” 发射测试



The screenshot displays the 'GSM900 Overview (TCH)' window. The main display area shows test results for 'P/t Norm. GMSK' with a 'RUN' indicator. The power levels are -11.6 dBm (Avg. Burst Power), -11.3 dBm (Peak Burst Power), and a red 'Out of Tol.' warning for Power Ramp. Below this, 'Phase Error GMSK' results are shown: 5 Hz Frequency Error, -1.0° Phase Error Peak, and 0.4° Phase Error RMS.

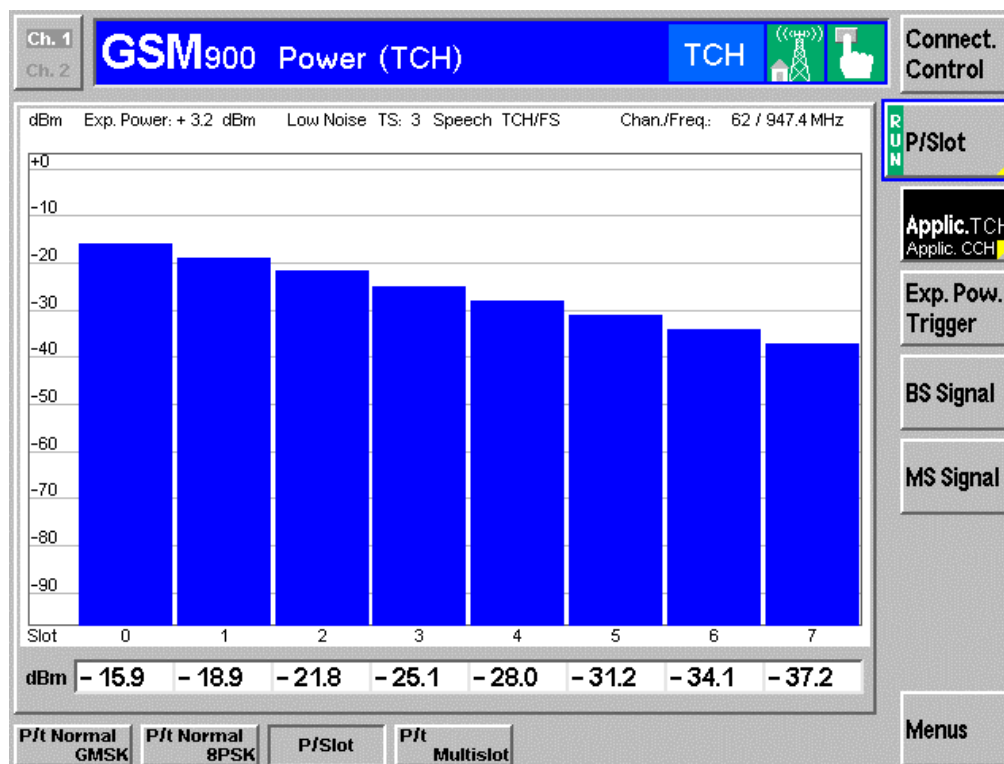
The 'Setup' window is open, showing the following parameters:

Category	Parameter	Value
Signalling Info	Sync Mode	CCH Sync.
	Signalling State	TCH-Test
SACCH Info	Requested Power	---
	Requested Timing	---
Meas. Control	Repetition	Continuous
	Stop Condition	None
	Display Mode	Current
	Statistic Count	100 Bursts
BS Signal	Control Channel	32
	Traffic Channel	64
MS Signal	RF Channel	0
	Timeslot	0
	Channel Type	Speech TCH/FS
	Training Sequence	GSM 0
MS Signal	Bit Stream	PSR 2E9-1
	Transmit Timing	0 ¼Bit

Navigation buttons at the bottom include Overview, Power, Modulation, Spectrum, Receiver Quality, and Menus. On the right side, there are buttons for 'P/t Norm. GMSK', 'Applic. TCH', 'Exp. Pow. Trigger', 'BS Signal', and 'MS Signal'.

CMU300 GSM/(E)GPRS

“Power versus Slot” 测量



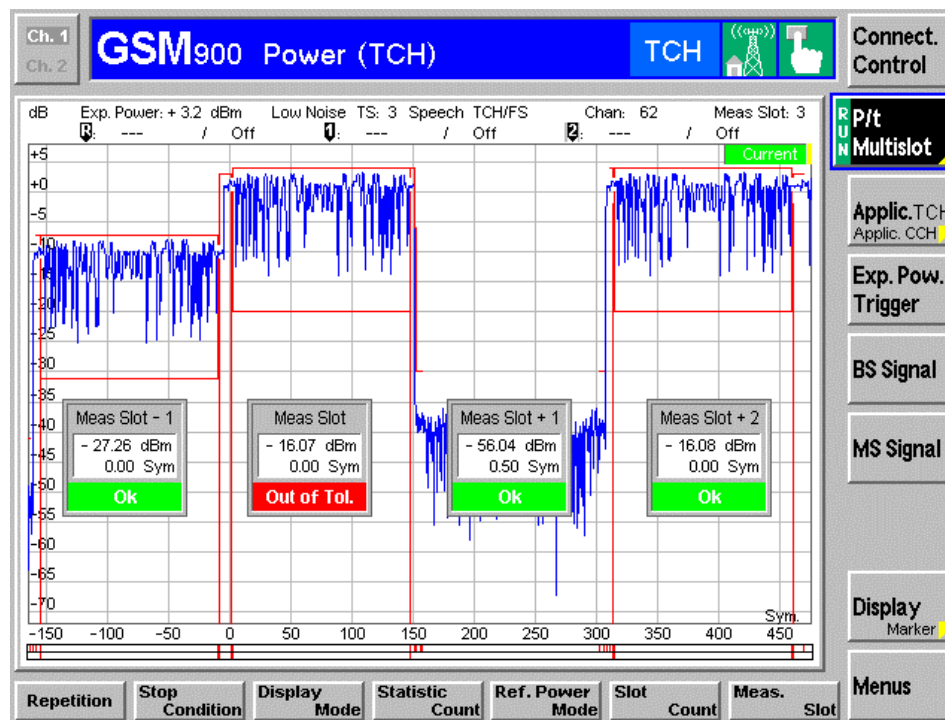
❖ 8 测量结果使用4.6 ms

❖ (假设全速的执行: 每个IEEE总线循环测量使用10 ms)

❖ 高速的同时具有高的测试精度 (0.5db)

CMU300 GSM/(E)GPRS

“Power versus Multislot” 测量



- ❖ 显示最多4个相邻时隙
- ❖ 自动监测信号的调制方式GMSK和8PSK
- ❖ 实时的激活相应的模板
- ❖ 缩放功能允许对每个时隙进行全屏显示

CMU300 GSM/(E)GPRS

BER test on **Circuit Switched Channels**



❖ **BER / RBER / FER** 在业务信道上的测试:

❖ GSM (GMSK): **TCH/FS, TCH/HS, TCH/EFS, TCH/F14.4, TCH/F9.6, TCH/F4.8, TCH/H4.8, TCH/H2.4**

❖ ECSD (8PSK) : **E-TCH/F43.2NT**

❖ **测试建立:**

❖ “BTS Loop” 在BTS / BSC内部

❖ “CMU as RF loop”

❖ **Optional:**

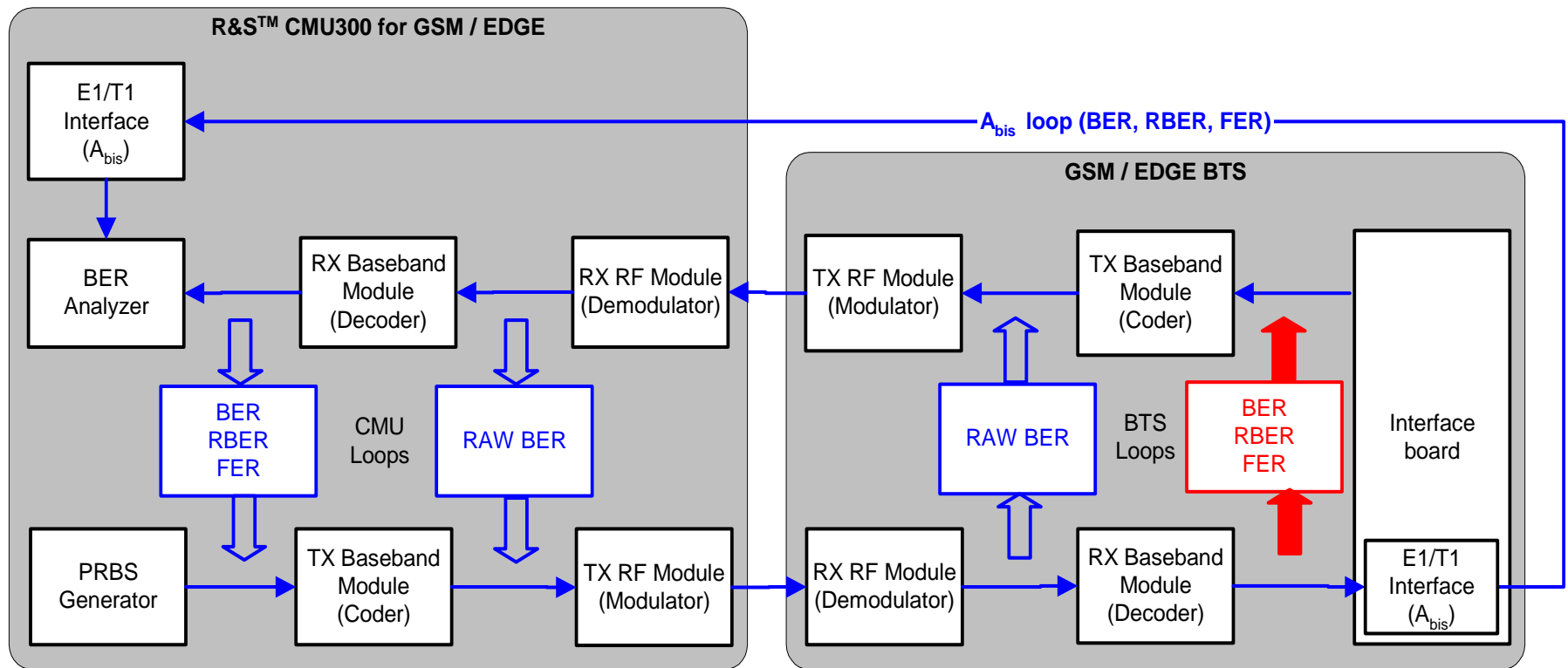
❖ Option CMU-B71: 通过**Abis** 接口的**BER / RBER / FER** 测试在GMSK 业务信道上 (“**Abis Loop**”)

❖ Option CMU-K39: 测试移动台功能(**GSM**),也就是通过信令程序MOC/MTC建议一个信道连接



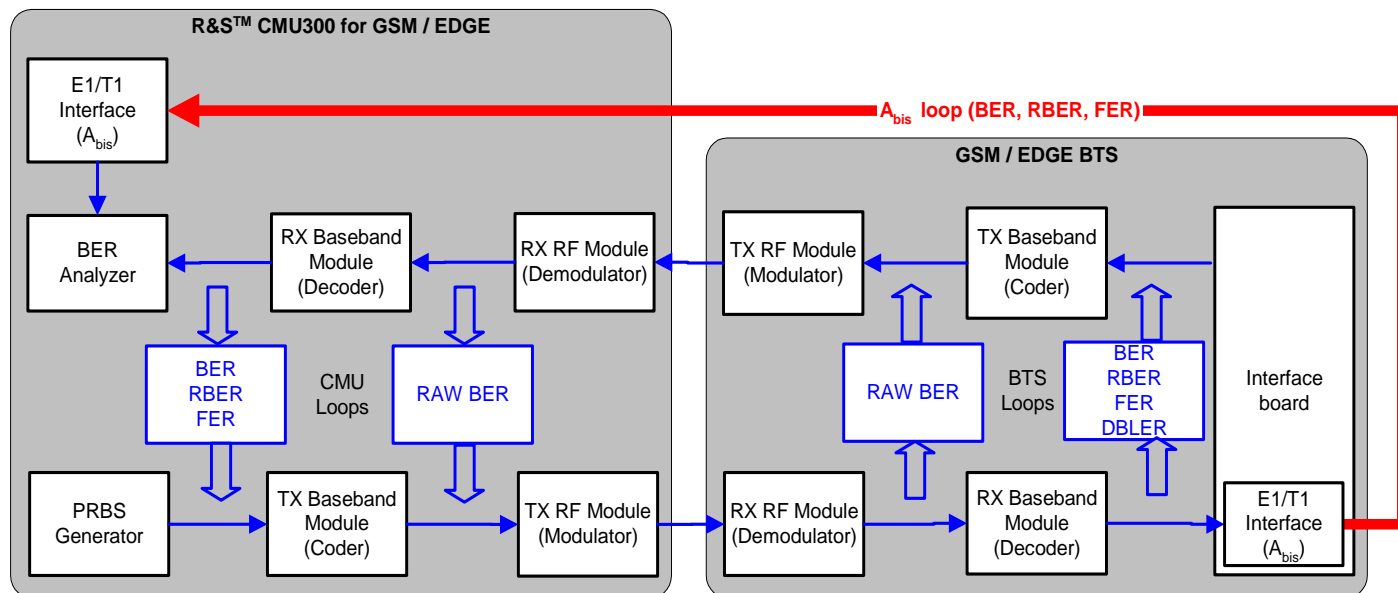
CMU300 GSM/(E)GPRS

BER test on Circuit Switched Channel / **BTS loop**



CMU300 GSM/(E)GPRS

BER test on Circuit Switched Channel / **Abis loop**



❖ 在Abis模式，BTS解码收到的数据并产生一个脉冲编码调制（PCM）的信号，这个信号被直接引入到CMU的Abis接口。有2个接口可以交替的用作Abis的输入接口：

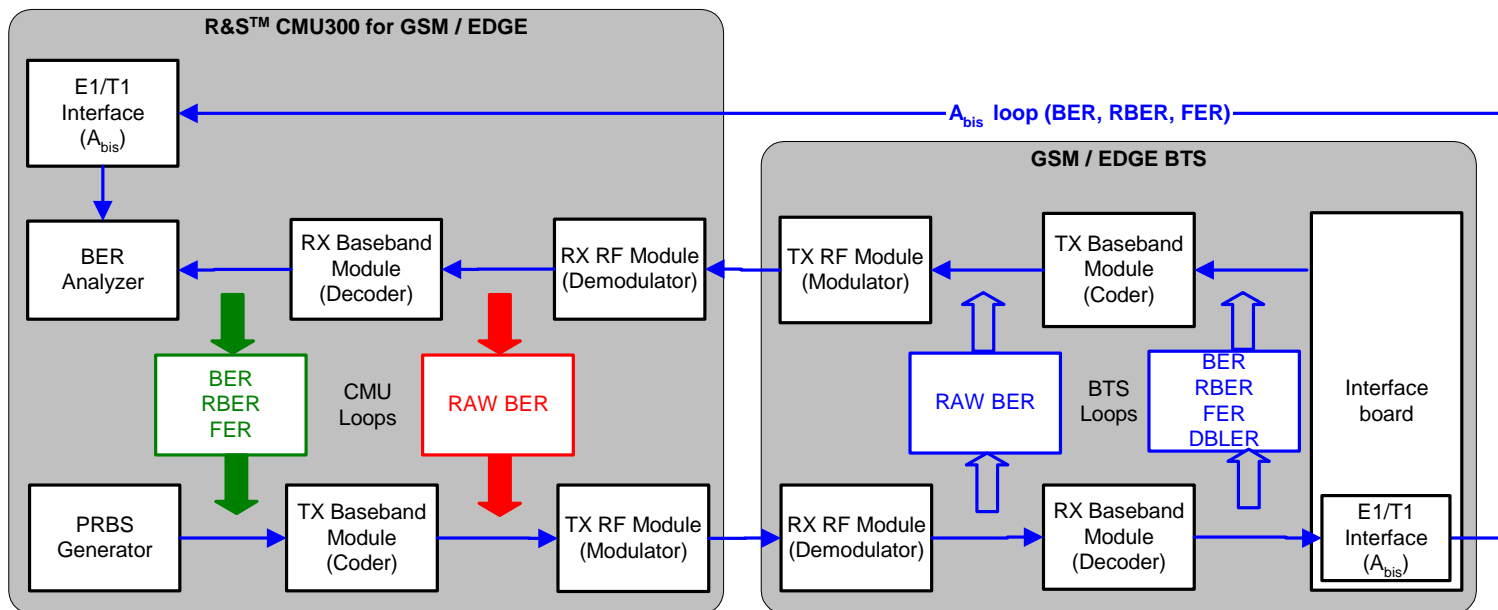
- ❖ 背板上的 75 Ω BNC 接头
- ❖ 背板上的 120 Ω 对称9针Sub-D接头

❖ 支持的信道类型：

- ❖ TCH/FS, TCH/EFS, TCH/F4.8, TCH/F9.6, TCH/F14.4

CMU300 GSM/(E)GPRS

BER test on Circuit Switched Channel / CMU as RF loop

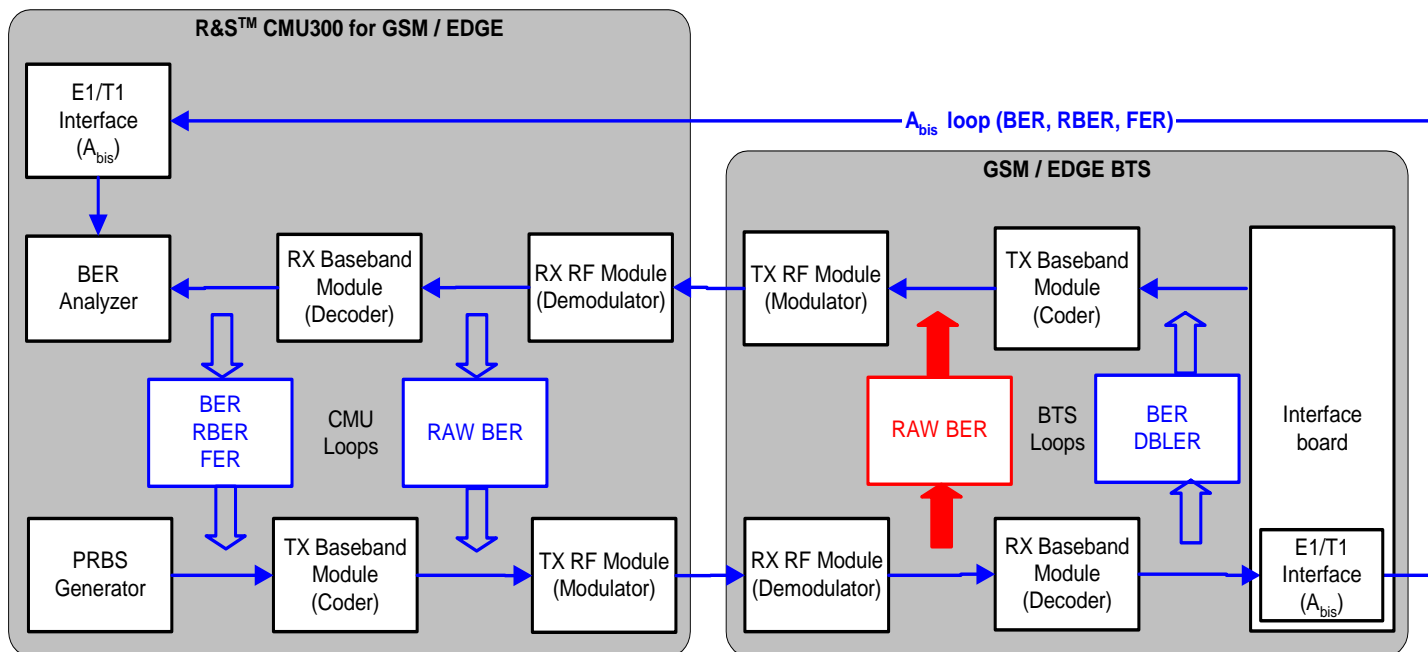


❖ 环回模式存在延迟。CMU返回接收到的数据往往经过1到50语音帧的延迟

❖ 不需要信道编码/解码的环回模式。这个模式只有在信道类型为TCH/FS 或 E-TCH/F43.NT 才能使用。

CMU300 GSM/(E)GPRS

BER test on Circuit Switched Channel / **Burst By Burst loop**



❖ 在Burst by Burst 模式下，CMU只发射而不经过程序保护（如同Class II）；没有guard码。信号环回在处于测试状态下的BTS在信道编码和解码前闭合。这样原始码被测量，从而BER时在Burst by Burst的基础上得到的

❖ 支持的信道类型：

❖ TCH/FS, TCH/EFS, TCH/HS, E-TCH/F43.2NT, PDTCH/MSC5 to 9

CMU300 GSM/(E)GPRS

BER test on Circuit Switched Channel / MMI



Ch. 1
Ch. 2

GSM900 Receiver Quality (TCH)

TCH

Connect. Control

Timeslot 3

0.000 %	BER II
0.000 %	BER Ib
0.000 %	FER
0	CRC Err

Time
0.00 s 2.00 s

Meas. Mode RBER / FER

Setup

- Meas. Control
 - Meas. Mode RBER / FER
 - Stop Condition None
 - Average 100
- BER Limit Config
 - Class II / BER 2.000 % Class II
 - Class Ib 0.400 %
 - FER 0.100 %
- Exp. Power/Trigger
 - Expected Power - 5.00 dBm
 - RF Mode Auto
 - RF Attenuation Low Noise
 - Trigger Source Signalling
 - Trigger Level Low
- BS Signal
 - TCH RF Channel 64 Ch
 - TCH Timeslot 3
 - TCH Ch. Type Speech TCH/FS
- MS Signal
 - TCH Level BER
 - used Timeslot - 10.0 dBm
 - unused TS 0.0 dB
 - Bit Stream BER PSR 2E9-1

BER CMU Average

Applic. TCH
Applic. CCH

Exp. Pow. Trigger

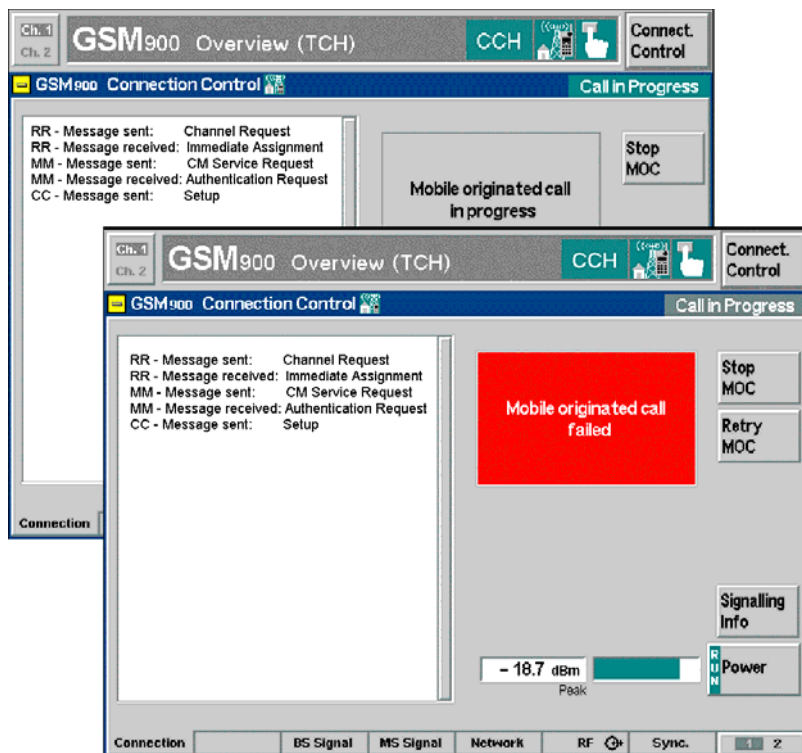
BS Signal

MS Signal

Expected Power RF Mode RF Attenuation Trigger Source Trigger Level Menus

CMU300 GSM/(E)GPRS

option CMU-K39



❖ The option CMU-K39 执行GSM信令程序，包括位置更新，移动台始呼，移动台终止呼叫，这些需要没有鉴权和加密的环境

❖ Option CMU-K39 支持下列的全速率信道：

- ❖ TCH/FS
- ❖ TCH/EFS
- ❖ TCH/F14.4
- ❖ TCH/F9.6
- ❖ TCH/F4.8

CMU300 GSM/(E)GPRS

BER test on Circuit Switched Channel / 功能列表



Channel type	Possible tests	Supported BTS/BSC loops	Supported loops "inside" R&S CMU (CMU as RF loop)	Channel setup procedure	Required SW options (in addition to R&S CMU-B21)	Comments
-	Burst by Burst (RAW BER)	BTS loop demodulator / modulator	R&S CMU RAW BER loop	Forced channel setup w ithout signalling	R&S CMU-K30 to -K34 (CMU-K41 optional for 8PSK)	GMSK and 8PSK supported
TCH/FS TCH/HS TCH/EFS	BER / RBER / FER	BTS (BSC) BER loop w ith channel decoding; (optional Loop via A _{bis})	R&S CMU BER loop w ith channel decoding	Forced channel setup w ithout call procedure (optional MOC/MTC)	R&S CMU-K30 to -K34 (CMU-B71 and CMU-K39 optional)	
TCH/F14.4 TCH/F9.6 TCH/F4.8 TCH/H4.8 TCH/H2.4	BER	BTS (BSC) BER loop w ith channel decoding	R&S CMU BER loop w ith channel decoding	Forced channel setup w ithout call procedure (optional MOC/MTC for full rate channels)	R&S CMU-K30 to -K34 (CMU-K39 optional)	
E-TCH/F43.2 NT	BER	BTS (BSC) BER loop w ith channel decoding	R&S CMU BER loop w ith channel decoding	Forced channel setup w ithout signalling	R&S CMU-K30 to -K34 and CMU-K41	

CMU300 GSM/(E)GPRS

BER test on **Packet Switched Channel**



❖ 支持的 **GPRS (GMSK)** 信道类型:

– PDTCH/CS1; PDTCH/CS2; PDTCH/CS3; PDTCH/CS4

❖ 支持的**EGPRS (GMSK / 8PSK)** 信道类型:

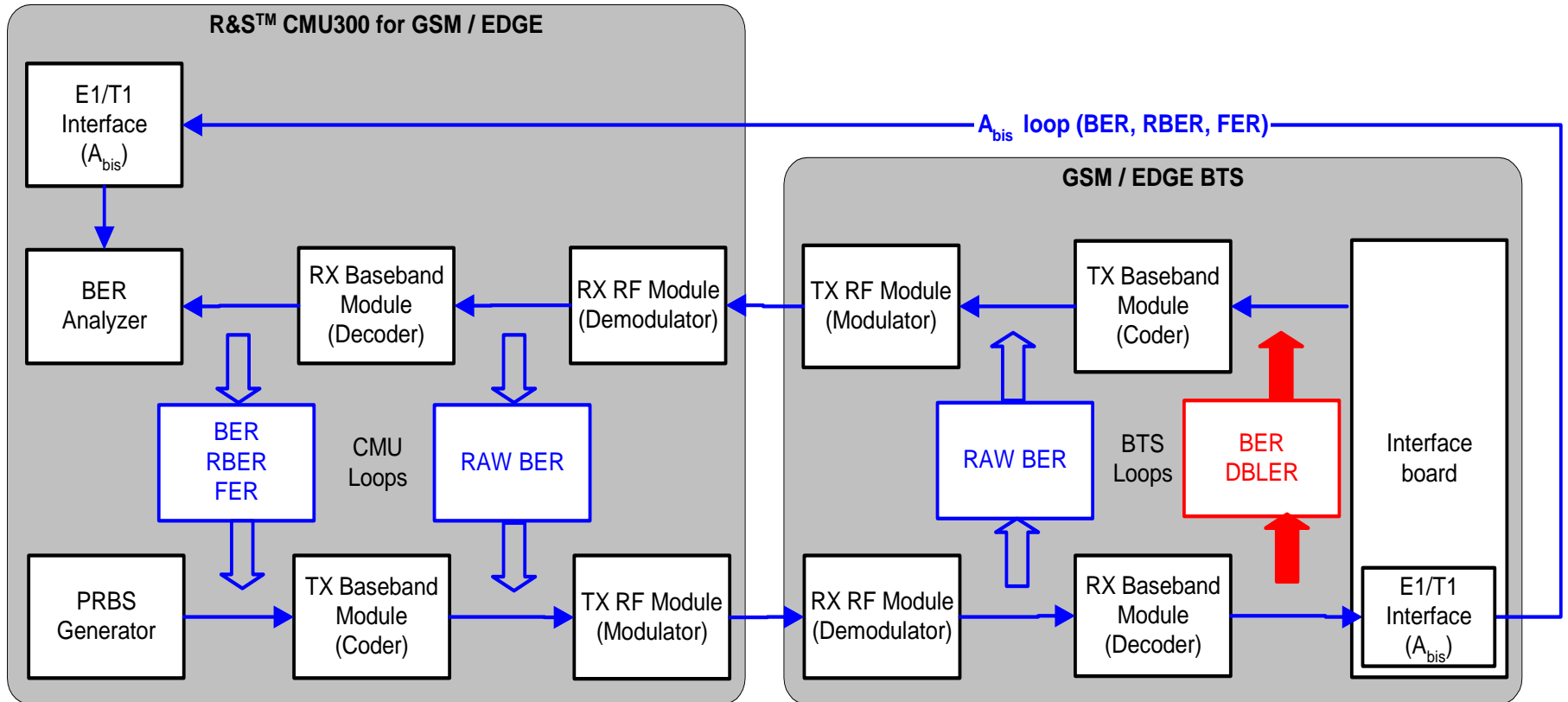
– PDTCH/MCS1; PDTCH/MCS2; PDTCH/MCS3; PDTCH/MCS4;
PDTCH/MCS5; PDTCH/MCS6; PDTCH/MCS7; PDTCH/MCS8; PDTCH/MCS9

❖ 测试状态:

- ❖ The **BTS**必须在一个特定的测试模式下操作，也就是说一个静态的**RF**连接（一个时隙激活）必须被支持（**GPRS/EDGE**信道在某个**RF**时隙上被激活）
- ❖ 信道激活不需要任何的信令过程
- ❖ 建立“**BTS loop**”
- ❖ 测量的类型(**DataBLER** or **BLER**) 有赖于不同的环回

CMU300 GSM/(E)GPRS

BER test on Packet Switched Channel / **BTS loop**



CMU300 GSM/(E)GPRS

BER test on Packet Switched Channel / 功能列表



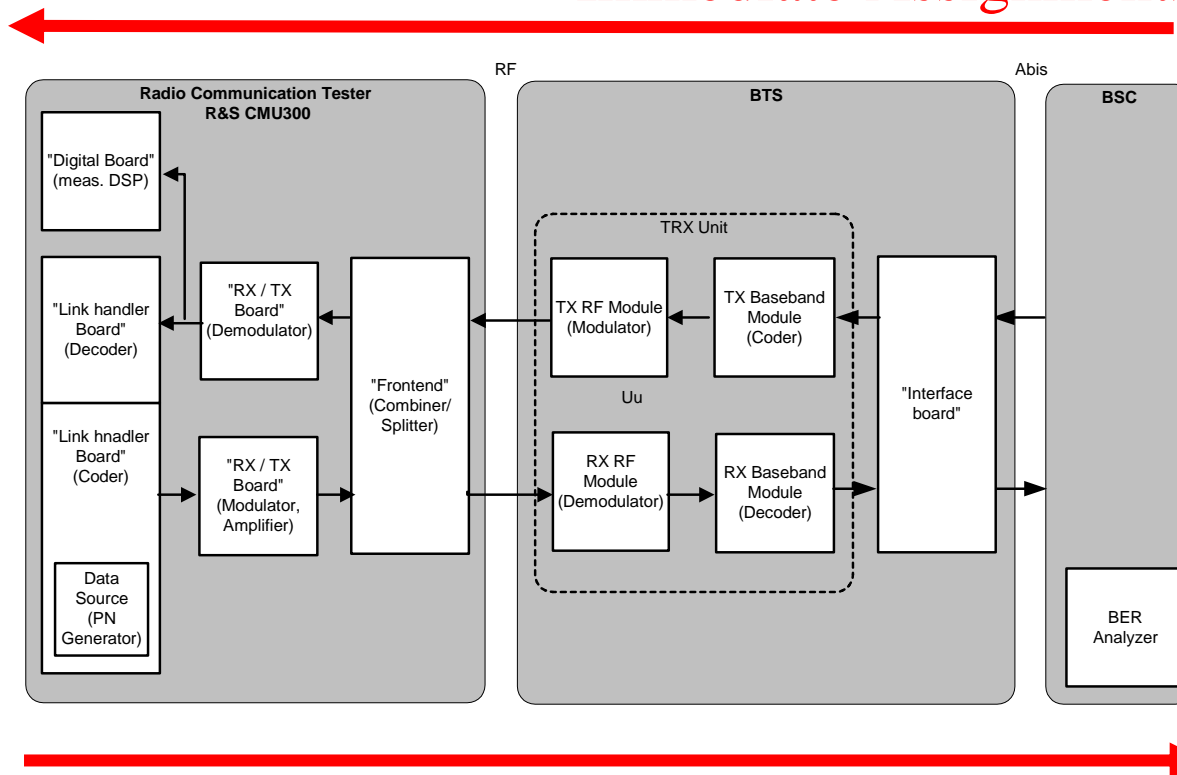
Channel type	Possible tests	Supported BTS/BSC loops	Supported loops "inside" R&S CMU (CMU as RF loop)	Channel setup procedure	Required SW options (in addition to R&S CMU-B21)	Comments
PDTCH-CS1 PDTCH-CS2 PDTCH-CS3 PDTCH-CS4	BER / DBLER	BTS BER/DBLER loop w ith channel decoding, w ithout RLC MAC	R&S CMU BER/DBLER loop w ith channel decoding	Forced channel setup w ithout signalling (one static TS active on up-/dow nlink)	R&S CMU-K30 to -K34	Special BTS test mode required
PDTCH-MCS1 PDTCH-MCS2 PDTCH-MCS3 PDTCH-MCS4 PDTCH-MCS5 PDTCH-MCS6 PDTCH-MCS6 PDTCH-MCS7 PDTCH-MCS8 PDTCH-MCS9	BER / DBLER	BTS BER/DBLER loop w ith channel decoding, w ithout RLC MAC	R&S CMU BER/DBLER loop w ith channel decoding	Forced channel setup w ithout signalling (one static TS active on up-/dow nlink)	R&S CMU-K30 to -K34 and CMU-K41	Special BTS test mode required

CMU300 GSM/(E)GPRS

RACH 测试



Immediate Assignments

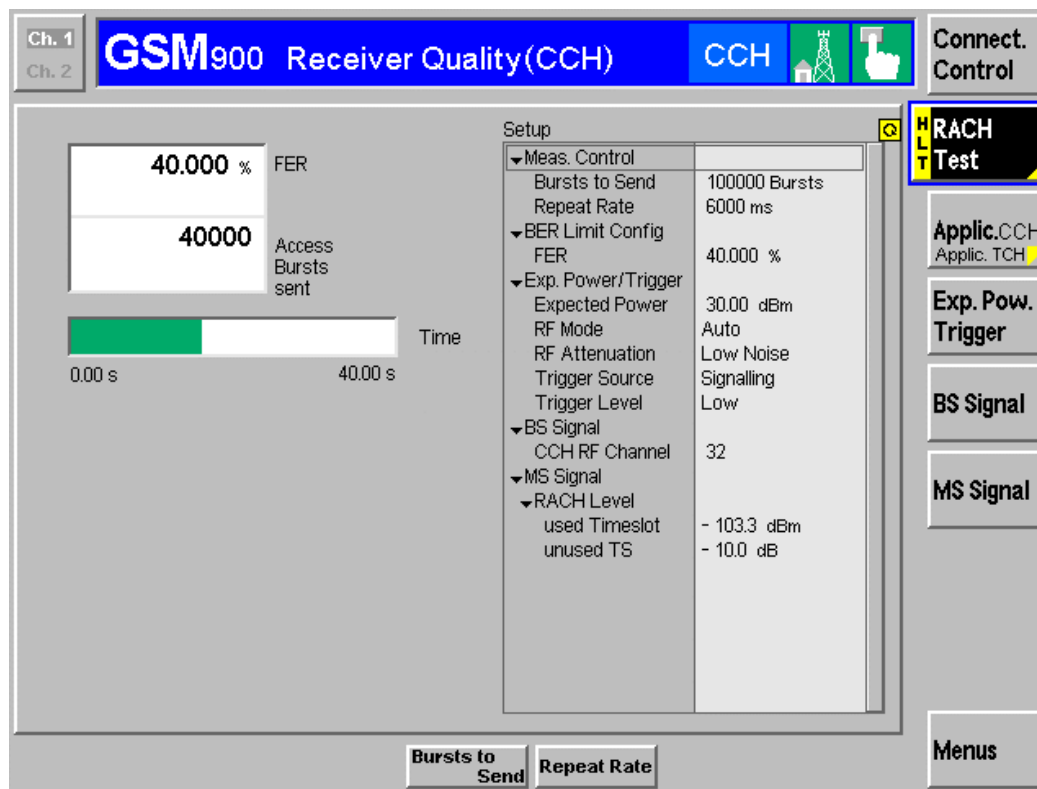


Access bursts

- 可变的重复周期用于网络压力测试
- 可变的电平用于RACH接收灵敏度测量

CMU300 GSM/(E)GPRS

RACH 测试



FER (RACH) = Access bursts without IMMEDIATE ASSIGNMENT

Total number of access bursts * 100%

CMU300 GSM/(E)GPRS

测试信令信道: 使用PN数据的UL发生器



❖ 支持的信道:

- ❖ 慢速随路控制信道 (SACCH)
- ❖ 快速随路控制信道 (FACCH/F)
- ❖ 独立专用控制信道 (SDCCH/4, SDCCH/8)

❖ 测试建立 set-up:

- ❖ CMU提供一个PRBS调制的上行 (UL) 信号
- ❖ 测试必须在BTS或BSC内完成

❖ 需要软件option CMU-K38 !

CMU300 GSM/(E)GPRS

在慢速跳频模式下的测试



❖通过呼叫激活 (需要Option CMU-K39):

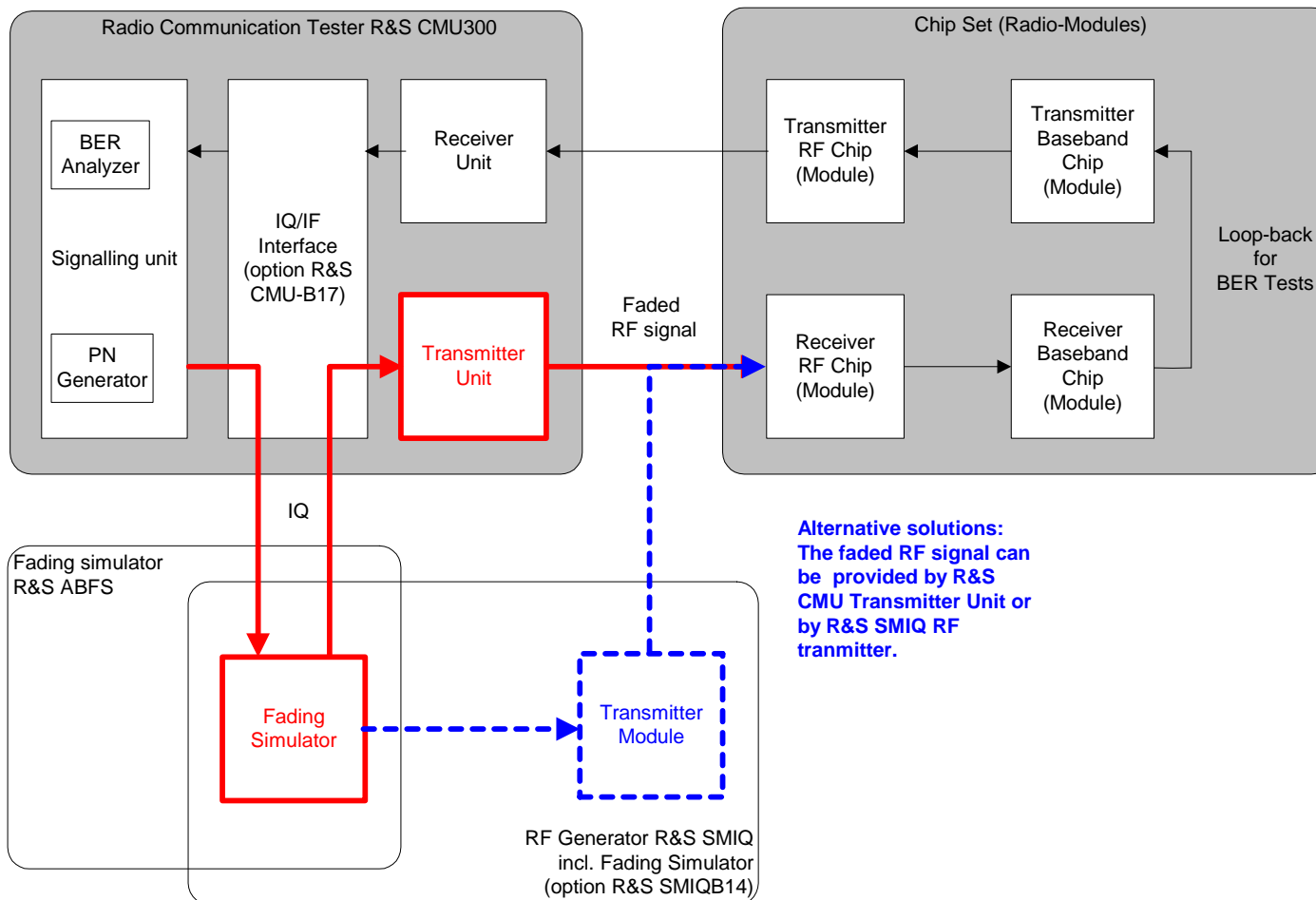
- CMU同步到BCCH
- 使用MOC/ MTC信令程序激活跳频信道
- 基站发送跳频需要的参数 (移动台分配索引, 跳频序列)
- 基于当前帧数, CMU按照规范 TS 05.02 开始跳频
- GSM业务信道支持 (TCH/FS, TCH/EFS, TCH/F4.8, TCH/F9.6, TCH/F14.4)

❖“Forced Hopping” 模式 (不需要呼叫处理激活)

- CMU同步到 BCCH.
- 手工输入跳频参数 (移动台分配索引, 跳频序列)
- 一旦业务信道被打开, 基于当前帧数, CMU按照规范 TS 05.02 开始跳频
- 最常用的 GSM / GPRS / EGPRS 业务信道包括 PDTCH / CS-1...4 和 PDTCH / MCS-1....9

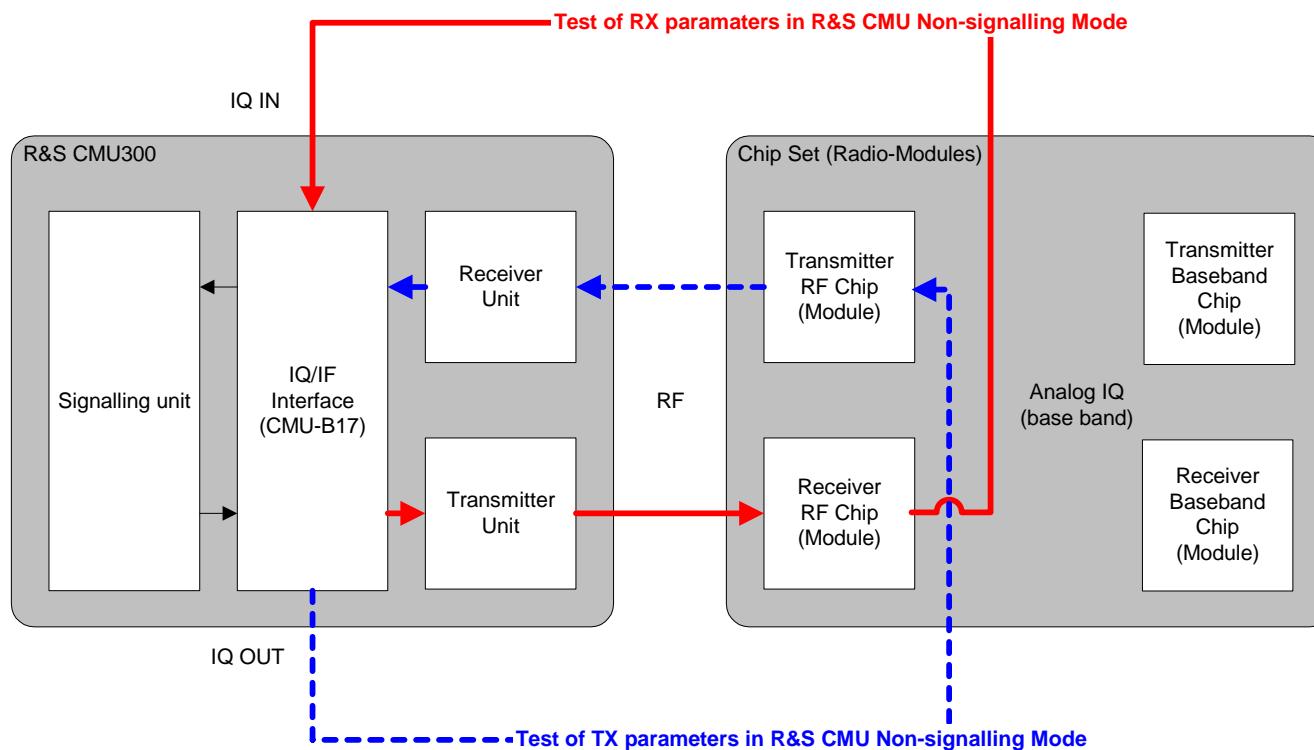
CMU300 GSM/(E)GPRS

IF/IQ interface CMU-B17: 衰落应用



CMU300 GSM/(E)GPRS

IF/IQ interface CMU-B17: 模块测试应用



CMU300 3GPP FDD

概要



❖ 测量模式:

❖ Non-signalling mode:

- TX 测试 (DL) 基于 DL 测试模块
- UL 信号发生器 (参考测量信道) 用于 RX BER 测试

❖ 依据规范 3GPP TS 25.141 测量

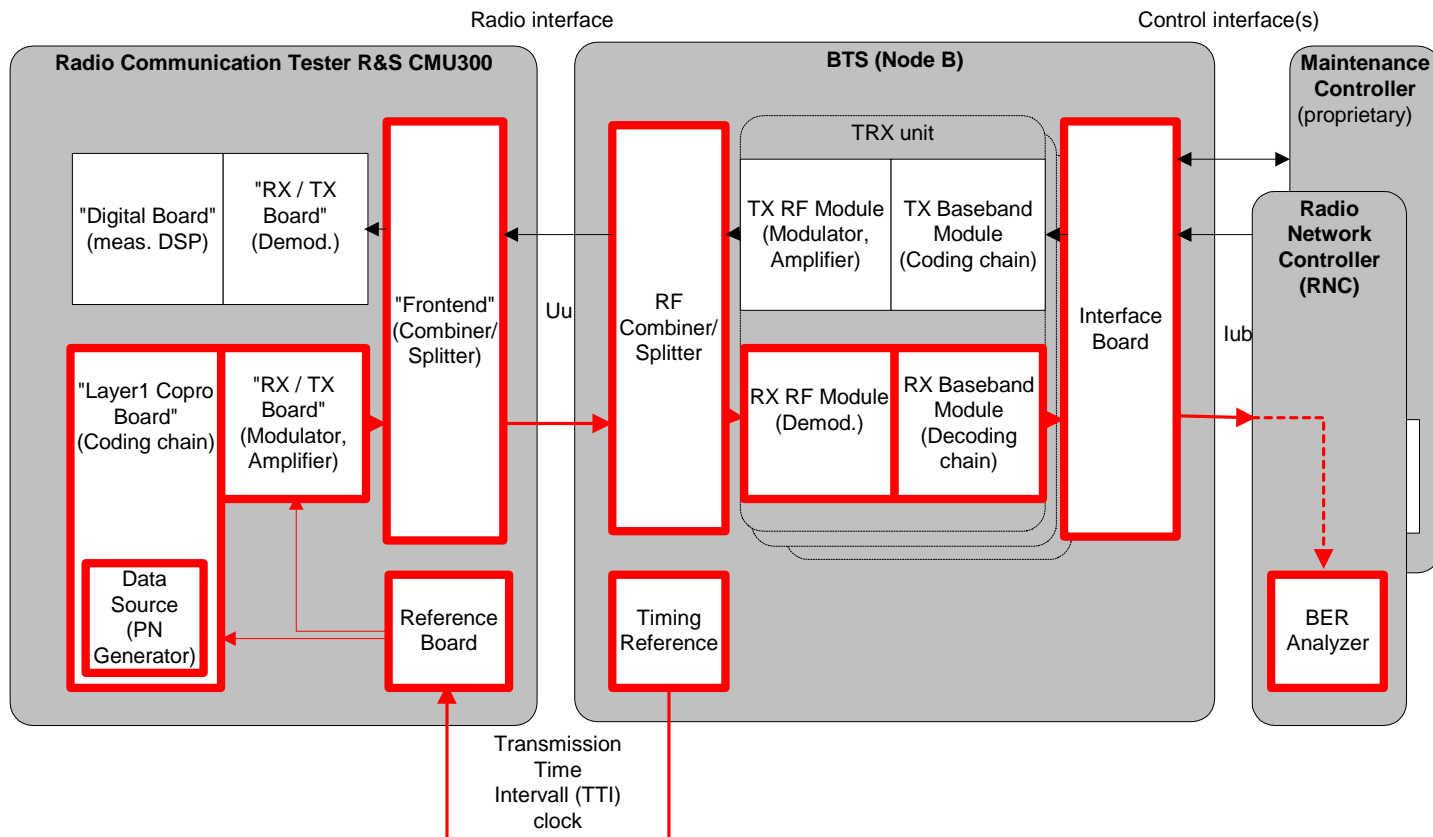
❖ 配置:

❖ 分开的 options 用于 TX 和 RX 测试:

- Options CMU-U75 和 CMU-K75 用于 TX 测试
- Options CMU-B76 和 CMU-K76 用于 RX 测试 (发射机功能)

CMU300 3GPP FDD

Non-signaling \ UL发射机建立



Involved blocks for RX testing

CMU300 3GPP FDD

Non-signaling \ UL发射机可能的模式



❖ 信道模式 “3GPP reference”

- ❖ 包括信道编码和物理信道多路复用
- ❖ 数据导入专用业务信道DTCH
- ❖ 所有5个3GPP TS25.141规范中的参考测量信道都支持
- ❖ 对于CMU300 DL 信道的同步，需要一个有赖于信道类型（20ms, 40ms, 80ms）的发射时间间隔时钟（TTI）

❖ 信道模式 “physical”

- ❖ 没有信道编码
- ❖ 数据直接到入物理信道DPDCH的数据区
- ❖ 对于CMU300 UL信道的同步，需要一个来自Node-B的帧触发（10ms）

CMU300 3GPP FDD

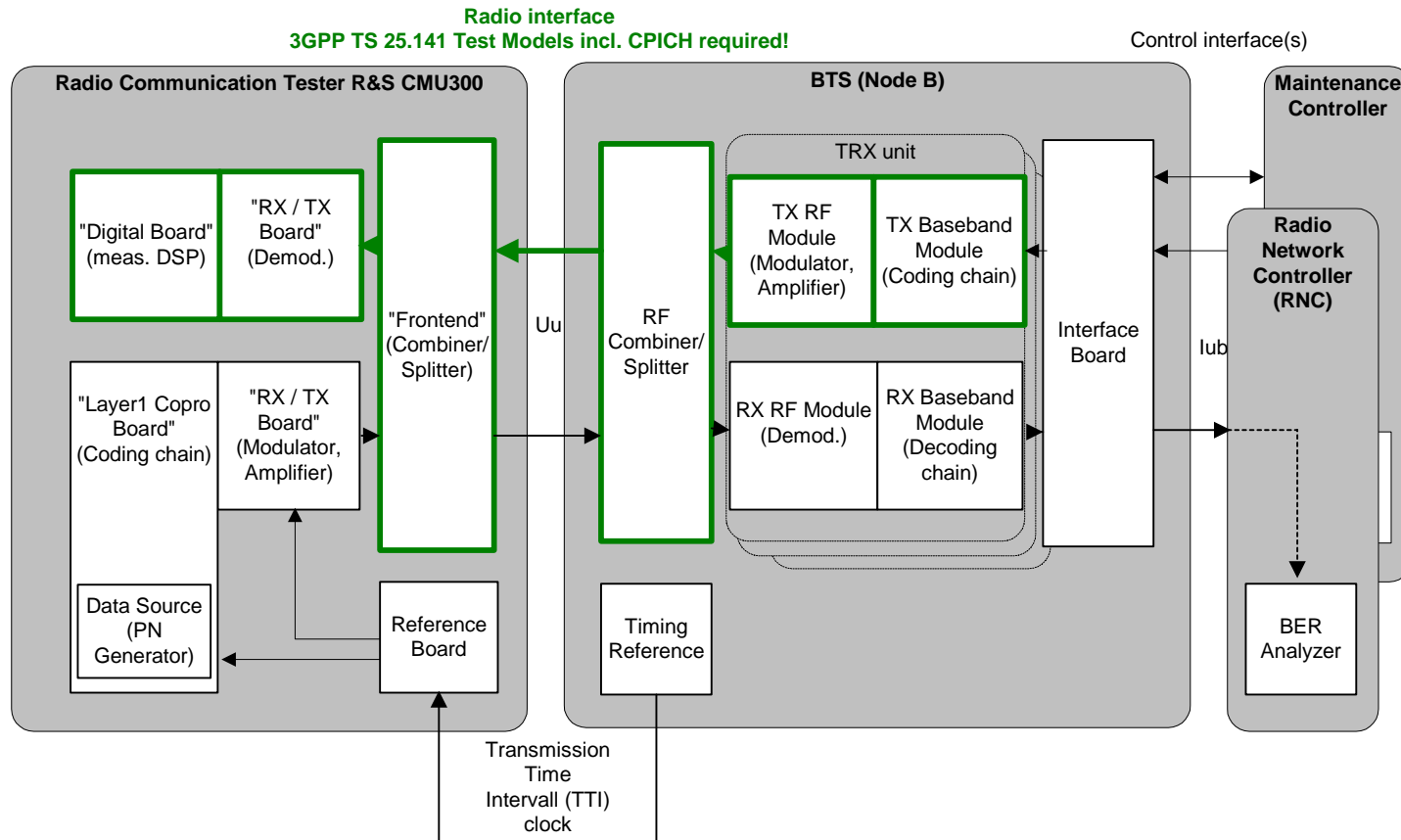
Non-signaling \ UL发射机与规范TS25.141



Chapter 25.141	Title	Covered by CMU300	Remarks
7	Receiver characteristics		
7.2	Reference sensitivity level	yes	-CMU incorporates generator for the required signal -TTI clock for synchronization procedure is required -BER evaluation to be performed inside the BTS or by a separate BER analyzer
7.3	Dynamic range	yes	-Please see 7.2 / remarks -Additionally: separate signal generator (AWGN) to be used
7.4	Adjacent channel selectivity (ACS)	yes	-Please see 7.2 / remarks -Additionally: separate signal generator (WCDMA interferer) to be used
7.5	Blocking characteristics	yes	- Please see 7.2 / remarks -additionally: separate signal generator (WCDMA interferer) to be used
7.6	Intermodulation characteristics	yes	- Please see 7.2 / remarks -Additionally: separate signal generators (CW and WCDMA interferer) to be used
7.8	Verification of the internal BER calculation	planned	-SW version V3.25

CMU300 3GPP FDD

Non-signaling \DL接收测量建立



Involved blocks for TX testing

CMU300 3GPP FDD

Non-signaling \ DL接收测量与规范 TS25.141



Chapter 25.141	Title	Covered by CMU300	Remarks
6.2	Base station output power		
6.2.1	Base station maximum output power	yes	- Free-run measurement based on 5 MHz bandpass filter - Timeslot selective measurement is also possible; CPICH for timing alignment is required; measurement filter RRC, 3.84 MHz, roll-off 0.22
6.2.2	CPICH power accuracy	yes	Measurement filter RRC, 3.84 MHz, roll-off 0.22
6.3	Frequency error	yes	CPICH for timing alignment is required
6.4	Output power dynamics		
6.4.1	Inner loop power control	yes	-Code channel power to be changed by node B controller -CPICH for timing alignment is required; measurement filter RRC, 3.84 MHz, roll-off 0.22
6.4.2	Power control steps	yes	-Please see 6.4.1 / remarks
6.4.3	Power control dynamic range	yes	-Please see 6.4.1 / remarks
6.4.4	Total power dynamic range	yes	-Please see 6.4.1 / remarks
6.5	Output RF spectrum emissions		
6.5.1	Occupied bandwidth	yes	
6.5.2	Out of band emission		
6.5.2.1	Spectrum emission mask	yes	
6.5.2.2	Adjacent channel leakage power ratio (ACLR)	yes	Measurement filter RRC, 3.84 MHz, roll-off 0.22
6.7	Transmit modulation		
6.7.1	Error vector magnitude	yes	CPICH for timing alignment is required; measurement filter RRC, 3.84 MHz, roll-off 0.22
6.7.2	Peak code domain error	yes	Please see 6.7.1 / remarks

Applicable for single RF carrier test conditions!

Thank you for your attention

