LOCOSTO PROGRAM

Application note APN 224

RF scenarios with ETM

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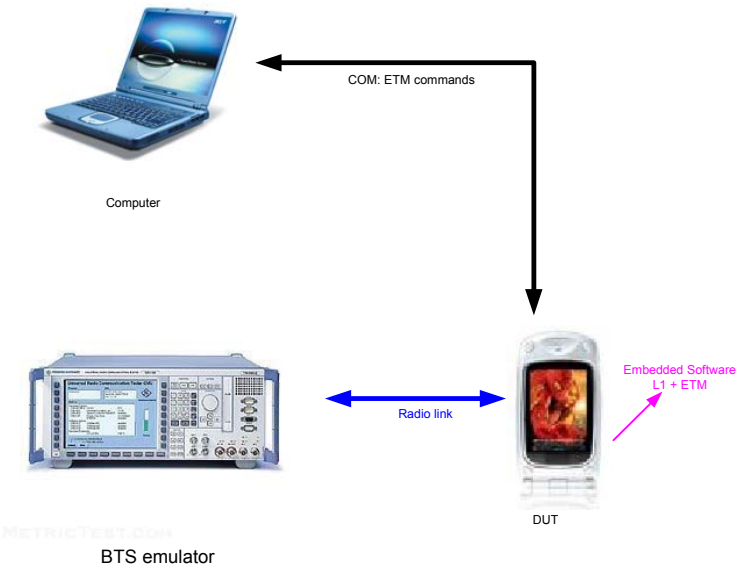
REVISION HISTORY

Rev#	Date	Author	Reason for change
1.0	11-17-05	F. Chalet	Creation
1.1	01-17-05	F. Chalet	Updated table of content Updated section 4.5
1.2	01-25-05	F. Chalet	Added GPRS section (2.3 and 4.5)
1.3	21-02-06	F. Chalet	Updated section 4.6 Updated section 3.6 Updated section 3.7

1 Introduction

Purpose of this document is to describe the basic procedure for call establishment between a DUT (Mobile station embedding L1 software and its associated test mode) and a Base station simulator (CMU200).



Once the call between DUT and BSS is established, user is able to perform all RF measurements traditionally done at mobile phone antenna port like:

- Receiver quality / Sensitivity measurement
- Transmitter phase error (RMS, peak)
- Transmitter spectrum (spectrum due to modulation, switching transient)
- …

Note: In this document it is assumed that the measurement instrument is a Rohde & Schwarz CMU200. But the measurement instrument could be any other instrument used for measuring GSM mobile station in test mode.

2 How to place a cal in “Reduced Signaling mode”

The BSS is configured to use a "reduced signalling mode", which requires that the MS performs a Network Synchronization before establishing a loop back but removes the need for all the high level protocol exchanges. This means that the BS does not send any commands to the MS and that the MS does not send any protocol data (like RXLEV or RXQUAL information).

2.1 Call set up description

In order to enable non signaling Synchronized mode on the CMU200 the following steps have to be performed:

Step	Equipment	Action
1	CMU	Reset the CMU200 for enabling default settings
2	CMU	Select function group GSM 900 overview
3	CMU	Select Network folder - Expand Item Circuit Switched - Expand item Signaling Modes -Set the Signaling Channel to None - Expand item Timeouts - Set the Radiolink Timeout Testset to OFF - Set the MTC Timeout to OFF - Expand Item Packet Data -Expand item Bit Stream - Set 2E9-1 PSR Bit Pattern
4	CMU	Select BS Signal folder. - Expand item Traffic Channel - Set the RF Channel to the required test channel
5	CMU	Go back to the Signaling folder
6	MS (using ETM)	Set the BCCH and the required test channel (TCH)
7	MS (using ETM)	Set the TSC and Timeslot corresponding to the CMU200 default setting
8	MS (using ETM)	Make the MS loop back the received data (enable TCH_LOOPBACK_A)
9	MS (using ETM)	Synchronize the MS with CMU200 frequency wise
10	MS (using ETM)	Synchronize the MS with CMU200 timing wise
11	MS (using ETM)	Set the MS to do RX and TX on the specified TCH
12	CMU	the “Call to MS” button on the CMU200 for entering Non Signaling Synchronized Mode
13	CMU	Check that the Frequency error / Average burst power monitored by the CMU200 is OK
14	CMU	. Select the required measurement mode (Spectrum or Receiver Quality) from the submenu on the CMU200

2.2 ETM procedure for MS control:

Step	Equipment	Module	Action	Comment
1	ETM v	core	tms 1	Enter ETM
2	ETM v	rf61	rfpw x y z	Band Select: Band / x / Y / z GSM850 / 7 / 7 / 0 EGSM900 / 7 / 6 / 0 GSM1800 / 7 / 6 / 1 GSM1900 / 7 / 3 / 0
3	ETM v	rf61	rfpw 1 BCCH_ARFCN	BCCH_ARFCN = Mid ARFCN from Table 1
4	ETM v	rf61	rxpw 2 2	set rx timeslot
5	ETM v	rf61	txpw 1 1	Set tx power level
6	ETM v	rf61	rfpw 2 TCH_ARFCN	TCH_ARFCN = Mid ARFCN from Table 1
7	ETM v	rf61	txpw 11 0	Set Training Sequence
8	ETM v	rf61	txpw 9 5	Set Loopback A
9	ETM v	rf61	scw 16 5	Set number of times to loop within RFE
10	ETM v	rf61	scw 17 5	Set number of loops before returning statistic results
11	ETM v	rf61	scw 18 5	Set number of loops between auto reset of statistics
12	ETM v	rf61	rfe 13	Start of the synchronization process: Receive frequency burst type 0
13	ETM v	rf61	scw 16 5	Set number of times to loop within RFE
14	ETM v	rf61	scw 17 5	Set number of loops before returning statistic results
15	ETM v	rf61	scw 18 5	Set number of loops between auto reset of statistics
16	ETM v	rf61	rfe 12	continue of the synchronization process: Receive frequency burst type 1
17	ETM v	rf61	scw 16 5	Set number of times to loop within RFE
18	ETM v	rf61	scw 17 5	Set number of loops before returning statistic results
19	ETM v	rf61	scw 18 5	Set number of loops between auto reset of statistics
20	ETM v	rf61	rfe 11	Continue of the synchronization process: Receive synchronization burst
21	ETM v	rf61		Press ‘connect mobile’ on CMU
22	ETM v	rf61	scw 16 10	Set number of times to loop within RFE
23	ETM v	rf61	scw 17 10	Set number of loops before returning statistic results
24	ETM v	rf61	scw 18 10	Set number of loops between auto reset of statistics
25	ETM v	rf61	rfe 10	Finish the synchronization process: Receive BCCH
26	ETM v	rf61	scw 16 0	Set number of times to loop within RFE
27	ETM v	rf61	scw 17 0	Set number of loops before returning statistic results
28	ETM v	rf61	rfe 3	Start equivalent of a dedicated mode (RX + TX + PM bursts)

Table 1: ARFCN selection range (ARFCN selection is valid for TCH, BCCH and PDTCH)

	GSM 850	E-GSM900	GSM1800	GSM1900
Low ARFCN	128-134	975-981	512-518	512-518
Mid ARFCN	187-193	35-41	696-702	658-664
High ARFCN	245-251	118-124	879-885	804-810

2.3 ETM procedure for MS control in GPRS mode.

CMU settings to make a GPRS call with mobile in reduced signaling mode
(following example is single slot)

Step	Equipment	Action
1	CMU	Reset the CMU200 for enabling default settings in signaling
2	CMU	Select function group GSM 900 overview
3	CMU	Select Network support. Set “GSM+GPRS” Select Main Service. Set “Packet Data” Select Service Selection. Set “Red. Sig. Mode B”
4	CMU	Select BS Signal folder. - Set Traffic Channel et level (channel 62 in this example) - Set BCCH channel and level (channel 32 in this example) - Main time slot (channel 3 in this example)
5	CMU	Select Connect Control ant then Network - Set Coding Scheme (CS1 in this example)
6	CMU	Select Connect Control ant then Connection folder - Press “Signal on”
7	MS (using ETM)	Run script of section 4.5
8	CMU	the “Connect Mobile” button on the CMU200 for entering Non Signaling Synchronized Mode
9	CMU	Check that the Frequency error / Average burst power monitored by the CMU200 is OK
10	CMU	. Select the required measurement mode (Spectrum or Receiver Quality) from the submenu on the CMU200

Specific GPRS ETM instructions of script in section 4.5 are:

rfpw 20 <class>
Select the GPRS multislot class <class> [1..12]

rxpw 28 <HEXA>
Select which time slots of the TDMA frame are allocated for downlink packet transfer.
The <HEXA> value is the hexadecimal value of an 8 bit word representing slots. Slot 0 is MSB.
Example:
Rxpw 28 0x30 selects two RX slots at slots 2 and 3.

txpw 28 <HEXA>
Select which time slots of the TDMA frame are allocated for uplink packet transfer.
The <HEXA> value is the hexadecimal value of an 8 bit word representing slots. Slot 0 is MSB.
Example:
Rxpw 28 0x30 selects one TX slot at slot 3.

txpw <TX_SLOT> <PCL>
Select the GPRS transmit power level <PCL> for a specific time slot <TX_SLOT>
Slot 0 corresponds to <TX_SLOT>=20, Slot 1 corresponds to 21, … , slot 7 corresponds to 27

rfpw 4 62
Select PDTCH ARFCN.

txpw 29 <TS0_CS> <TS1_CS> <TS2_CS> <TS3_CS> <TS4_CS> <TS5_CS> <TS6_CS> <TS7_CS>
Select Coding scheme <CS> for all time slots:
<TS0_CS> is the coding scheme for time slot 0 …
Valid values of coding scheme:
2 corresponds to CS1
4 corresponds to CS2
5 corresponds to CS3

6 corresponds to CS4
Note that only the allocated TX time slot are considered.
Example:
Txpw 29 2 0 0 0 0 0 0 0 will select coding schem CS1 for TX time slot 0

txpw 9 11
Select loopback “Reduced signaling mode loopback B” on CMU

Rfe 4
Start GPRS packet transfer.

3 How to change main RF settings through ETM

3.1 ETM procedure for changing PA power ramp shapes:

➢ Introduction

TX Locosto ramping up and ramping down are achieved during 5 bit (5/270.833e3= 18.4us).
One ramp shape is described using 1 coefficient every ¼ bit ⇨ 20 coefficients (coded on 8 bits)
Output data rate is every ¼ bit.
Up to 16 ramp shapes (identified by an index) by band can be defined (16 ramp-up + 16 ramp-down) to best fit into the power ramping mask specification depending on selected band and power level.

According to the sign of the power step to be performed, ramp-up or ramp-down coefficients are selected.
The sequence of 10-bits words fed to the 10bit APC DAC is:

$$Level(i) = Level_{init} + (step_{level} / 256) \cdot \left(up[i] * (1 - sign_{step}) + dw[i] * sign_{step} \right)$$

where:

$level_{init}$ is the current power level
$step_{lev}$ is the power level step to be done
up[i] are the coefficients of the ramp-up
dw[i] are the coefficients of the ramp-down
$sign_{step}$ is the sign of $step_{lev}$ (0 for plus, 1 for minus)

The default ramp shape for each power level and for each band is defined in TPU file **l1_rf61.c**
For debug purpose it is possible to modify any ramp shape using ETM.

➢ Useful ETM commands

txpr 5: After band set-up and TX power level set-up, it is possible to get the index of the selected ramp shape by using the “txpr 5” ETM command:

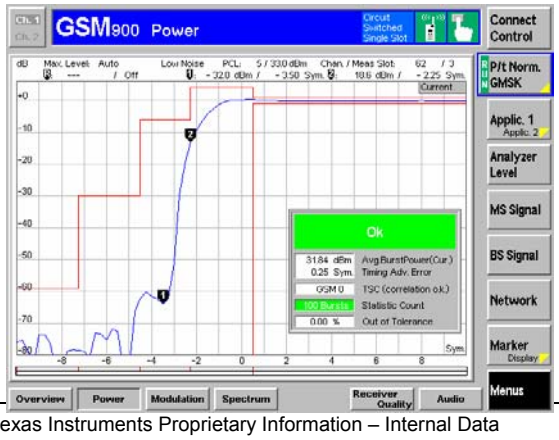
txpw 5 <index> : After band set-up and TX power level set-up, it is possible to set the ramp shape index by using the “txpw 5 <index>” ETM command. <index> has to be between 0 and 15 in GMSK.

ttr <index>: This ETM command allows to read the 20 coefficients of ramp-up followed by the 20 coefficients of ramp down.

ttw <index> <40 values>: This ETM command allows to redefine the 20 coefficients of ramp-up followed by the 20 coefficients of ramp down describing the ramp shape of index <index>.

➢ Example

Running script of Annex 3.2 gives the following ramp shape:



Current ramp index table is:

GSM900/GSM800:	PCL<=5	ramp index=0
	5<=PCL<=19	ramp index = PCL – 5
	PCL>19	ramp index = 14
DCS1800/PCS1900:	PCL<=0	ramp index = 0
	0<=PCL<=15	ramp index = PCL
	PCL>=15	ramp index = 15

In our example, band is GSM900, PCL=5 so “txpr 5” should answer:

TX_RAMP = 0 (index=0)

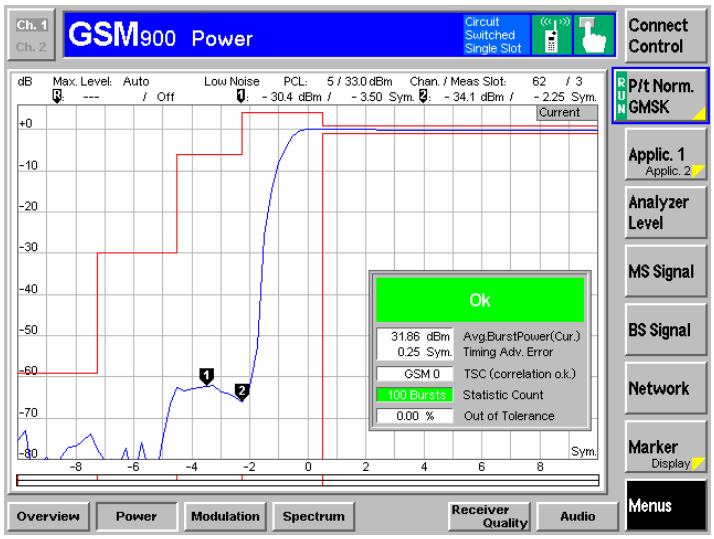
Current ramp coefficients are printed using “ttr 0”

RAMP0 = 0 0 0 0 0 0 0 0 4 17 37 64 95 127 160 191 218 238 251 255
255 251 238 218 191 160 127 95 64 37 17 4 0 0 0 0 0 0 0 0

First line are the 20 ramp-up coefficients, second line are the 20 ramp down coefficients.
Inserting …

ttw 0 0 0 0 0 0 0 0 0 1 2 3 4 5 6 7 50 100 150 200 255
255 251 238 218 191 160 127 95 64 37 17 4 0 0 0 0 0 0 0 0

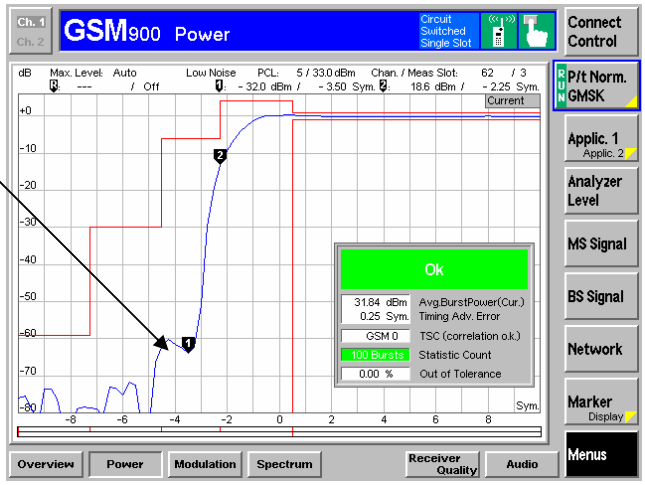
… before rfe3 in our script example will change the ramp up sequence:



3.2 ETM procedure for changing PA power ramp offset:

➢ Introduction

Before each ramp-up, PA power control signal (APC output) is set to an offset value that determines the PA output power just before the ramp-up. This APC offset can be tuned digitally up to 250mV using a 4mV/LSB resolution.



➢ How to change APC offset register:

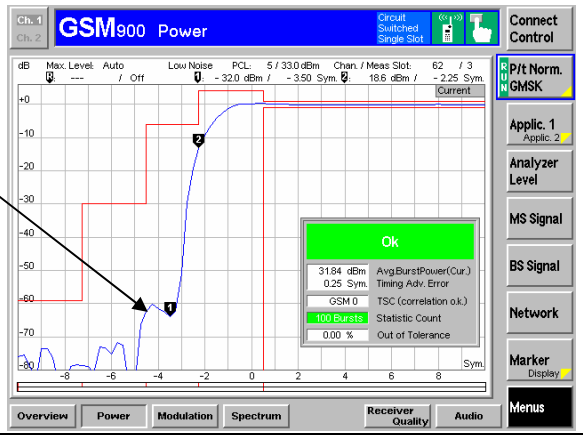
APC offset value is stored in a register named APCCTRL2 inside Wrapper.

-APCCTRL2 default value (01C8) is stored in a TPU file: l1_rf61.h

-For debug purpose, APCCTRL2 can be modified using ETM commands:
There is no specific ETM command to change APC offset so it has to be changed by writing in APCCTRL2 register.
Address 0xFFFF500C (via ARM) can not be read/written using ETM commands.
This register has to be modified through DSP using the following address: 0xFFD001E4,
Setting for other bits than APCOFF is:
-bit 15:9 = “000000”
-bit 7:2 is the APC offset value
-bit 8 = 1
-bit 1 = 0
-bit 0 = 0
In order to be validated in APCCTRL2 register inside wrapper, ETM command “rfe 0” has to be run just after.

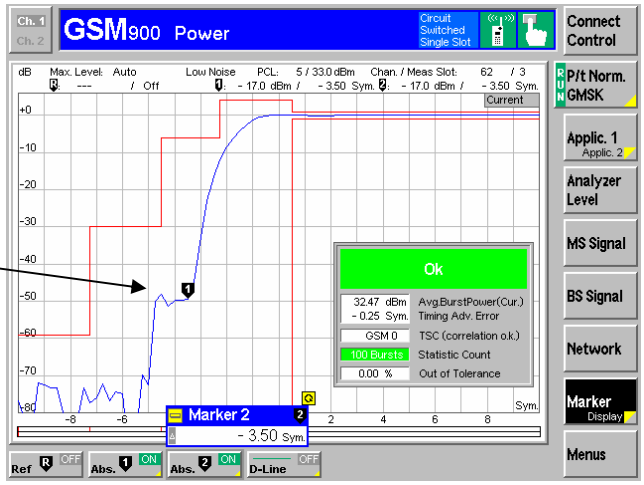
➢ Example

Running script of Annex 3.2 gives the following APC Offset (APCOFF=110010): Pout ~ -60dBm



Adding the following two lines before the synchronization procedure will increase the APC offset register (APCOFF=111111)
mw -2 0xFFD001E4 0x01FC
rfe 0

Pout ~ -50dBm



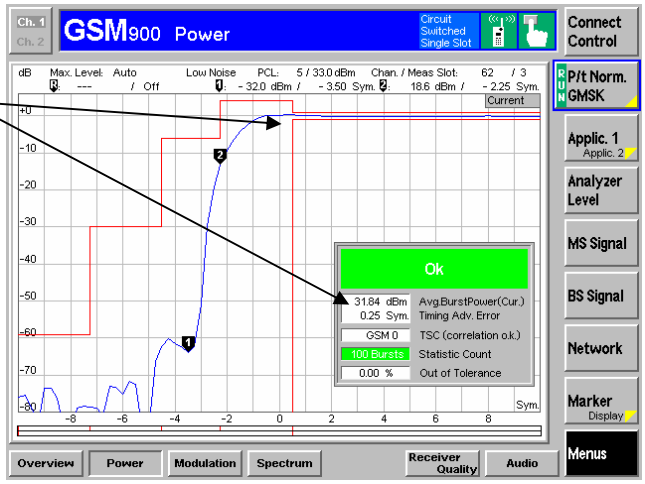
3.3 ETM procedure for changing PA power levels

➢ Introduction

For each band, all power levels are calibrated in production by tuning digital control word of Analog Control Output (APC).
Default value for all levels are stored in the TPU file l1_rf61.c

The maximum APC-out level is minimum 2.1 Volt. With a 10 bit resolution this gives roughly a resolution of 2.1 mV/LSB

For debug purpose, TX power levels can be changed using ETM commands



➢ ETM commands to change TX power levels

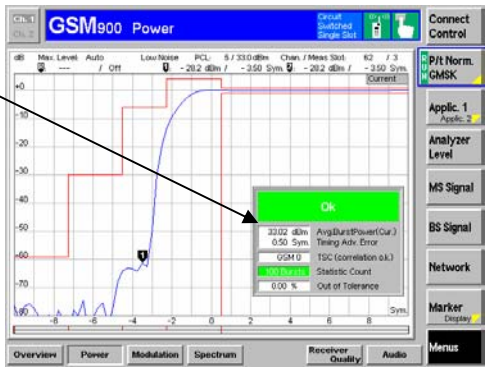
txpr 4: After a having set-up a band and a power level, this command allows reading of the APC digital word controlling the PA power level.

txpw 4 <pa_level>: This command allows to force the APC digital word controlling the PA power level. <pa_level> is between 0 and 1023.

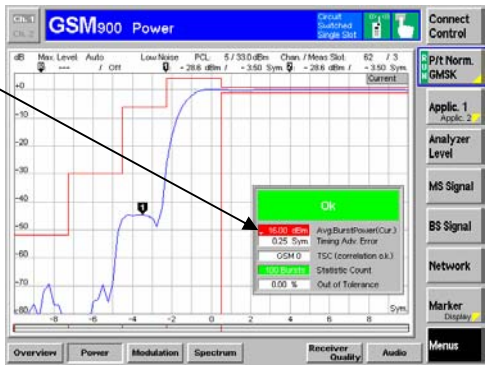
➢ Example

Running script of Annex 3.2 gives an output power level of 33 dBm.

Txpr 4 indicates a APC digital word equal to 457
(TX_APC = 457)



txpw 4 100 decreases output power level to 16 dBm



3.4 ETM procedure for changing TPU timings

➢ Introduction

For debug purpose TPU timings in RX (TRF_R1 …) and in TX (TRF_T1 …) can be modified using ETM commands without the need of software recompilation.
In order to run flexible TPU ETM command, the used software need to have **L1_TPU_DEV** compilation flag validated.

Note that
-if L1-TPU_DEV = 0 (TPU flexible not activated) TPU timings are defined in TPU file “tpudrv61.h”
-if L1-TPU_DEV = 1 (TPU flexible are activated) TPU timings default values are defined in TPU file “tpudrv61.c” by the vectors rf_rx_tpu_timings[] and rf_tx_tpu_timings[]

For more details about TPU timings, see application note “DRP control using TPU”

➢ ETM commands to change TPU timings

ftputr ETM command allows to read the current TPU timmings

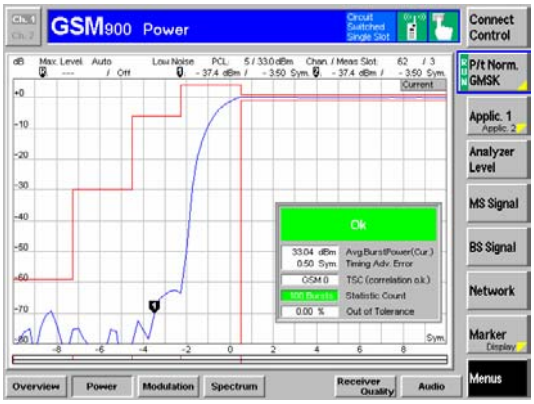
ftputr 1 => read all TX TPU timings
ftputr 2 => read all RX TPU timings
ftputr 10 => read TRF_RX1
ftputr 11 => read TRF_RX2
…
ftputr 41 => read TRF_RX32
ftputr 42 => read TRF_TX1
ftputr 43 => read TRF_TX2
…
ftputr 43 => read TRF_TX2
ftputr 73 => read TRF_TX32

ftputw ETM command allows to modify the current TPU timings

ftputw 10 x => write x in TRF_RX1
ftputw 11 x => write x in TRF_RX2
…
ftputw 41 x => write x in TRF_RX32
ftputw 42 x => write x in TRF_TX1
ftputw 43 x => write x in TRF_TX2
…
ftputw 73 x => write x in TRF_TX32

➢ Example

Using a software with L1_TPU_DEV option activated and running script of Annex 3.2 gives following transient power plot:

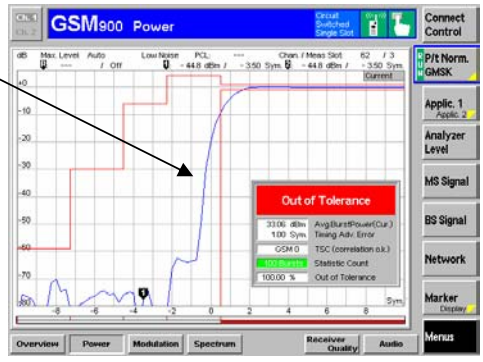


ftputr 1 returns
ALL_Tx_TPU= -280 -260 -46 -121 -51 16 29 37 -41 -1 15 19 25 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

We can for example change the TRF_T6 TPU timing (Beginning of APC window)
Ftputw *47 10*

(*ftputr 1* returns
ALL_Tx_TPU= -280 -260 -46 -121 -51 ***10*** *29 37 -41 -1 15 19 25 0 0 0*
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)

We can see the timing change effect on transient power plot:



3.5 ETM procedure for changing RX RSSI (over channel)

➢ Introduction

What we call "RX RSSI" in this section is a table of Arfcn/gain to flatten the gain response over frequency in the entire selected RX band.
This table allows splitting the band in 10 sub bands in order to calibrate the gain of each sub band.
Note that this table should be used to compensate gain variations on the band but not to compensate any absolute gain error.
RX RSSI values are stored in the TPU file l1rf61.c
For debugging purpose it is possible to change the RX RSSI values using ETM commands

➢ ETM commands to change RX RSSI

rftr 25 ETM command allows to read the RX RSSI values

rftw 25 ETM command allows to modify the current RX RSSI values

➢ Example

Running script of Annex 3.2:

rftr 25 returns:
rx_cal_chan= 10 0.0
30 0.0
51 0.0
71 0.0
90 0.0
112 0.0
124 0.0
991 0.0
992 0.0
1023 0.0

This means:
-up to Arfcn 10, RX gain calibration is +0.0dB
-up to Arfcn 30, RX gain calibration is +0.0dB
…
-up to Arfcn 1023, RX gain calibration is +0.0dB

In order to increase the gain by 2dB (resolution is 0.5 dB), as we are in this example using Arfcn 62, we will update line 4.

rftw 25 10 0.0 30 0.0 51 0.0 71 2.0 90 0.0 112 0.0 124 0.0 991 0.0 992 0.0 1024 0.0

3.6 How to change APC delay?

APC delay (delay before ramp-up and delay before ramp downs) is normally set in TPU file l1_rf61.h
#define APCDEL_DOWN (0)
#define APCDEL_UP (12)

For fine tuning, these delays can also be changed using address 0xFFD001E0.

How to read the default values: mr -2 0xFFD001E0 1
It should return 0x00C

Bits 4:0 correspond to APCDEL_UP (unit=qbit)
Bits 9:5 correspond to APCDEL_DOWN (unit=qbit)

How to change delays: mw -2 0xFFD001E0 0x002D

3.7 How to set RX in continuous mode (useful for RX matching)?

Here below is a script example to set RX in continuous mode,
Basically Pomer Measurement has to be disabled before running *rfe 8*

ti
tms 1
#select band - EGSM
rfpw 7 6 0
#select channel - both BCH and TCH
rfpw 1 62
rfpw 2 62
#disable AFC, AGC
rfpw 8 0
rxpw 8 0
#disable PM
rxpw 9 0
#set inital AFC DAC (set a proper value to minimize freq error)
rfpw 9 1030
#set AGC (only 2dB step is valid, the bottom bit reflects to lna_off)
rxpw 1 0
#set minimum TX power
txpw 1 15
 # Enable cont RX mode
rfe 8

4 Annex: useful test mode scripts

4.1 GSM850 Mid band

```
echo "GSM 850MHz Band Test Script"
echo "Init Testmode"
tms 1

# R&S Synch with script as BCCH, TCH, Timeslot and PCL.
# R&S BS signal/Mode -> BCCH or TCH
# at Network: circuit switched/signalling modes/signalling channel FACCH -> None
# at Network: circuit switched/Timeouts/Radiolink Timeout Testset 24 -> off

echo "set band"
# GSM 850MHz
rfpw 7 7 0

echo "BCCH"
rfpw 1 162

echo "Time slot"
rxpw 2 3

echo "Tx PCL"
txpw 1 5

echo "TCH"
rfpw 2 192

echo "Training Sequence"
txpw 11 0

echo "LOOPBACK B"
txpw 9 5

echo Rx 1 FB0 on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 13

echo Rx 1 FB1 on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 12

echo Rx 1 SB on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 11

#echo BCCH reading -> CMU press "Connect mobile"
echo "press connect"

scw 16 10
scw 17 10
scw 18 10
rfe 10

echo Tx+Rx on TCH
scw 16 0
scw 17 0
rfe 3
```

4.2 GSM900 Mid band

```
echo "GSM 900MHz Band Test Script"
echo "Init Testmode"
tms 1

#R&S Synch with script as BCCH, TCH, Timeslot and PCL.
# R&S BS signal/Mode -> BCCH or TCH
# at Network: circuit switched/signalling modes/signalling channel FACCH -> None
# at Network: circuit switched/Timeouts/Radiolink Timeout Testset 24 -> off

echo "set band"
# EGS 900MHz
rfpw 7 6 0

echo "BCCH"
rfpw 1 32

echo "Time slot"
rxpw 2 3

echo "Tx PCL"
txpw 1 5

echo "TCH"
rfpw 2 62

echo "Training Sequence"
txpw 11 0

echo "LOOPBACK B"
txpw 9 5

echo Rx 1 FB0 on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 13

echo Rx 1 FB1 on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 12

echo Rx 1 SB on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 11

#echo BCCH reading -> CMU press "Connect mobile"
echo "press connect"

scw 16 10
scw 17 10
scw 18 10
rfe 10

echo Tx+Rx on TCH
scw 16 0
scw 17 0
rfe 3
```

4.3 D180 Mid band

```
echo "DCS Band Test Script"
echo "Init Testmode"
tms 1

#R&S Synch with script as BCCH, TCH, Timeslot and PCL.
# R&S BS signal/Mode -> BCCH or TCH
# at Network: circuit switched/signalling modes/signalling channel FACCH -> None
# at Network: circuit switched/Timeouts/Radiolink Timeout Testset 24 -> off

echo "set band"
# DCS 1800MHz
rfpw 7 6 1

echo "BCCH"
rfpw 1 735

echo "Time slot"
rxpw 2 3

echo "Tx PCL"
txpw 1 0

echo "TCH"
rfpw 2 740

echo "Training Sequence"
txpw 11 0

echo "LOOPBACK B"
txpw 9 5

echo Rx 1 FB0 on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 13

echo Rx 1 FB1 on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 12

echo Rx 1 SB on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 11

#echo BCCH reading -> CMU press "Connect mobile"
echo "press connect"

scw 16 10
scw 17 10
scw 18 10
rfe 10

echo Tx+Rx on TCH
scw 16 0
scw 17 0
rfe 3
```

4.4 D190 Mid band

```
echo "PCS Band Test Script"
echo "Init Testmode"
tms 1

#R&S Synch with script as BCCH, TCH, Timeslot and PCL.
# R&S BS signal/Mode -> BCCH or TCH
# at Network: circuit switched/signalling modes/signalling channel FACCH -> None
# at Network: circuit switched/Timeouts/Radiolink Timeout Testset 24 -> off

echo "set band"
# PCS 1900MHz
#rfpw 7 3 0

echo "BCCH"
rfpw 1 600

echo "Time slot"
rxpw 2 3

echo "Tx PCL"
txpw 1 0

echo "TCH"
rfpw 2 610

echo "Training Sequence"
txpw 11 0

echo "LOOPBACK B"
txpw 9 5

echo Rx 1 FB0 on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 13

echo Rx 1 FB1 on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 12

echo Rx 1 SB on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 11

#echo BCCH reading -> CMU press "Connect mobile"
echo "press connect"

scw 16 10
scw 17 10
scw 18 10
rfe 10

echo Tx+Rx on TCH
scw 16 0
scw 17 0
rfe 3
```

4.5 GSM900 – GPRS (single slot)

```
tms 1
################################### GPRS
echo "GPRS multislot class"
rfpw 20 12

echo "RX in TS 3"
echo "Bit-mask|8|4|2|1|8|4|2|1|"
rxpw 28 0x10

echo "TS 3 for TX"
txpw 28 0x10

echo "Tx slot 3 -> PCL 5"
txpw 23 5

echo "CANAL PDTCH"
rfpw 4 62

echo "TX coding scheme CS1 = 2; CS2 = 4; CS3 = 5; CS4 = 6"
txpw 29 2 0 0 0 0 0 0 0

echo "LOOPBAcK 14: Loop Back B"
txpw 9 11
################################### GPRS

# EGS 900MHz
rfpw 7 6 0

echo "BCCH"
rfpw 1 32

echo "Time slot downlink"
rxpw 2 3

echo "Tx PCL"
txpw 1 5

###echo "TCH"
###rfpw 2 62

echo "Training Sequence"
txpw 11 0

###echo "LOOPBACK B"
###txpw 9 5

echo Rx 1 FB0 on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 13

echo Rx 1 FB1 on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 12

echo Rx 1 SB on BCCH
scw 16 5
scw 17 5
scw 18 5
rfe 11

scw 16 10
scw 17 10
scw 18 10
rfe 10

scw 16 0
scw 17 0

###rfe 3

################################### GPRS
rfe 4
################################### GPRS
```

4.6 Useful ETM commands for RF control:

➢ ti/tms/tmsh

ti => initialize test mode in target

tms 1 => start test mode session
tms 0 => finish test mode session

tmsh -p0 => launch test mode shell using full protocol stack software ("TraceMultiplexer" must be activated)
tmsh -p1 => launch test mode shell, communication on com port #1
tmsh -p2 => launch test mode shell, communication on com port #2

➢ rfpw (rfpr) see RD816 document

rfpw 1 32 => set BCCH ARFCN
rfpw 2 62 => set TCH ARFCN
rfpw 4 62 => set the PDTCH ARFCN (GRPS mode)
rfpw 7 6 0 => Standard=EGSM Band
rfpw 7 6 1 => Standard=DCS1800 Band
rfpw 7 7 0 => Standard=GSM850 Band
rfpw 7 3 0 => Standard=PCS1900 Band
rfpw 8 1 => enable AFC
rfpw 8 0 => disable AFC (AFC_VALUE here below is used)
rfpw 9 AFC_VALUE => set AFC value [-4096 … 4096]
rfpw 10 AFC_DEFAULT_VALUE => set AFC default value [-4096 … 4096]
rfpw 20 12 => Select the GPRS multislot class 12 [1..12]

➢ rxpw (rxpr) see RD816 document

rxpw 1 20 => Set AGC gain to 20dB or nearer AGC available gain. AGC algorithm has to be disabled.
Note that:
-if selected gain is even LNA is high gain
-if selected gain is odd LNA is low gain
Consequently gain step is 2dB.
In Locosto, AGC gain corresponds to ABE gain.
AGC>=24 => ABE gain = 23dB
19<AGC<24 => ABE gain = 20dB
17<AGC<20 => ABE gain = 17dB
13<AGC<18 => ABE gain = 14dB
11<AGC<14 => ABE gain = 11dB
7<AGC<12 => ABE gain = 8 dB
5<AGC<8 => ABE gain = 5 dB
1<AGC<6 => ABE gain = 2 dB
AGC<=1 => ABE gain = 0 dB
rxpw 2 3 => Set the timeslot to use for the downlink normal bursts.
rxpw 8 1 => Enable AGC algorithm (default mode)
rxpw 8 0 => Disable AGC algorithm.
rxpw 9 1 => Enable power measurement in TCH/PDTCH (default mode)
rxpw 9 0 => Disable power measurement in TCH/PDTCH
rxpw 28 01 => Select which time slots of the TDMA frame are allocated for downlink packet transfer.
The "01" value is the hexadecimal value of an 8 bit word representing slots. Slot 0 is MSB.

➢ txpw (txpr) see RD816 document

txpw 1 5 => Set power level [0 … 31]
txpw 4 100 => Set APC value to be used for the current power level.
txpw 5 5 => Set the APC ramp shape index to be used in the current TX power level
txpw 6 1 => Set the index of the TX channel calibration table for the current TX power level
txpw 9 0 => TX data are all '0' (default)
txpw 9 1 => TX data are all '1'.
txpw 9 2 => TX data are alternating '01010…'.
txpw 9 3 => TX data are pseudo random bit sequence 1
txpw 9 4 => TX data are pseudo random bit sequence 2
txpw 9 5 => TCH_LOOPBACK_A
txpw 9 6 => TCH_LOOPBACK_B
txpw 9 1 => Reduced signaling mode Loopback B in GPRS.
txpw 10 0 => Set the timing advance. Value is a positive number of qbits. Default is 0.
txpw 11 5 => Select the training sequence
txpw 20 5 => Select the GPRS transmit power level 5 for time slot 0.
txpw 21 5 => Select the GPRS transmit power level 5 for time slot 1.
txpw 22 5 => Select the GPRS transmit power level 5 for time slot 2.
txpw 23 5 => Select the GPRS transmit power level 5 for time slot 3.
txpw 24 5 => Select the GPRS transmit power level 5 for time slot 4.
txpw 25 5 => Select the GPRS transmit power level 5 for time slot 5.
txpw 26 5 => Select the GPRS transmit power level 5 for time slot 6.
txpw 27 5 => Select the GPRS transmit power level 5 for time slot 7.
txpw 28 01 => Select which time slots of the TDMA frame are allocated for uplink packet transfer.
The "01" value is the hexadecimal value of an 8 bit word representing slots. Slot 0 is MSB.
txpw 29 2 0 0 0 0 0 0 0 => Select Coding scheme <CS> for all time slots (slot 0-slot1…). Valid values of coding scheme are 2->CS1, 4->CS2, 5->CS3, 6->CS4. Note that only the allocated TX time slot are considered.

➢ rftw (rftr) see RD816 document

rftr 17 => read RSSI (gain calibration over the band)
rftr 31 => first return parameter is Gmagic. (Input_power(dBm)=-Gmagic/2+DSP_PowerMeas-Gain_ABE)

➢ rfe - see RD816 document

rfe 0 => stop all RF activities
rfe 1 => enable RX slot only
rfe 2 => enable TX slot only and PM (if rxpr 9 = 1)
rfe 3 => enable RX, TX slots and PM (if rxpr 9 = 1)
rfe 4 => enable RX,TX slots and PM in GPRS (see section 2.3)
rfe 8 => activate cont RX (PM must be disabled)
rfe 10; rfe 11; rfe 12; rfe 13 => synchronization process

➢ sr - see RD816 document

sr 2 0x1 => Read receiver level (RXLEV/RSSI)
sr 2 0x2 => Read DSP power measurement (PM)
sr 2 0x3 => Read both RXLEV and dsp PM.

➢ Miscellanous

Echo toto => report "toto" in shell window
#comment => # allows adding comments in script file
run –p "C:\ETM\scripts" gsm900.etm => executes scritpts "gsm900.etm" located in C:\ETM\scripts