

Tune-Up Procedure

Content

1 Purpose	1
2 General description	2
2.1 Characteristics of the transmit burst	2
3 Parameters	3
3.1 Parameters used to shape the burst	3
3.2 Parameters used to define the temporal position of the burst	3
3.2.1 Optimum position of the burst	3
3.2.2 Optimum length of the burst	3
4 Operating mode	4
4.1 How to transmit a Tch burst (Random data), in GSM850 mode, channel 1900; PCS1900 mode, channel 661, at power control level max:	4
4.2 How to stop Tx measurements:	4
4.3 How to transmit a burst after modifying parameters	4
5 Purpose	5
6 Automatic frequency control	5
7 GPRS data transfer	6
8 Static frequency error and range	7

Tune-Up TX

1 Purpose

This panel gives the possibility to manage the mobile in the transmit mode. This window includes both:

- all the parameters (frequency band, RF channel, RF level to get the desire antenna output power...) the user needs to make the mobile transmitting,
- all the parameters needed to define a transmit burst,
- all the compensation table to be able to align the mobile in production. This

Tx_commands user guide is describing:

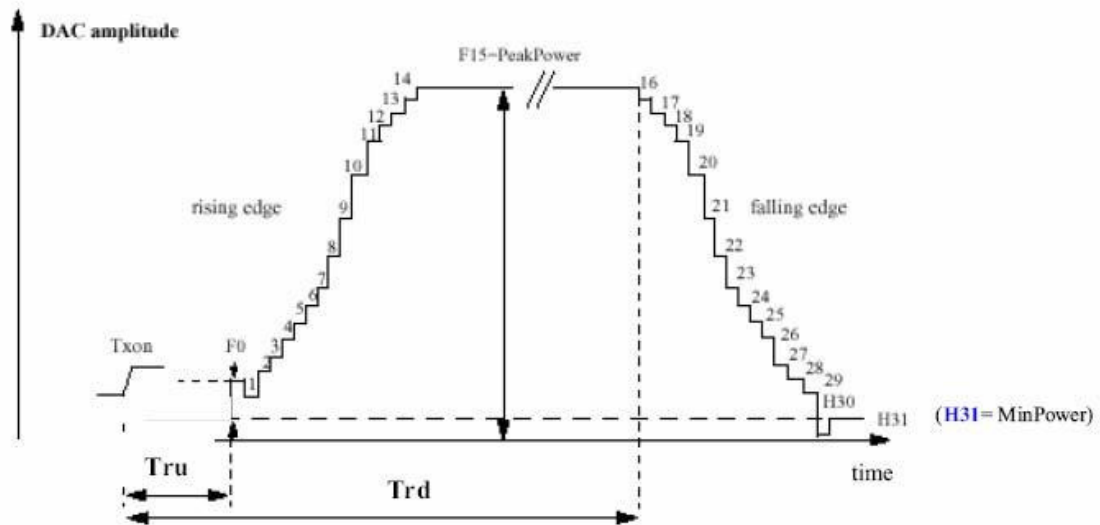
- the characteristics of the transmit burst,
- all the parameters used in the transmit mode,
- the operating mode to make the mobile transmitting

2 General description

2.1 Characteristics of the transmit burst

The power levels and the shape of a transmit burst are controlled by the power amplifier controller integrated in the BCM2093. The burst is generated a 10-Bits DAC from the BCM23550 by

as shown below: The ramping shape is referenced with the rising edge of Tx-ON (from the Baseband). There are two types of parameters define the transmit burst: the first one define the shapes of the burst, and the second one define the temporal position of the burst. The rising and the falling edge of the transmit burst are determined by a set of 32 DAC code values $n = 0 \dots 31$.



$$T_{ru} = T_{xTRUDefault} + \Delta TRU_P + \Delta TRU_T$$

$$T_{rd} = T_{xTRD_NBDefault} + \Delta TRD_P \text{ (for a normal burst).}$$

$$T_{rd} = T_{xTRD_ABDefault} + \Delta TRD_P \text{ (for an access burst).}$$

3 Parameters

F(n) are values coming from the DAC to shape the transmit burst. Some F(n) values have a corresponding parameter used in the TAT to align the mobiles. **Parameter used in TAT** = [F(n)].

3.1 Parameters used to shape the burst

-**H0** = [F(1)] controls the rate at which energy is given to the control loop at the beginning of the ramp. This energy is needed to bring the PA system control in a closed loop. This is the second code coming from the BCM23550 DAC. -**PeakPow** = [F(15)] corresponds to the peak power of the transmit burst. -**H30** = [F(30)] corresponds to the last ramping coefficients used to shape the ramp. -**MinPow** = [F(31)] is a fixed parameter and corresponds to the Code Start of the RF3237 specification. It ensures a fast discharge of accumulated energy during the open loop mode in the summing node.

3.2 Parameters used to define the temporal position of the burst

3.2.1 Optimum position of the burst

This parameter is **TRU** (or **Δ TRU_P**) on the panel, in the Optimal Burst. This is the burst starting time correction, which is optimised for each power control level. (Note that _P means that the parameter is a power compensation parameter).

3.2.2 Optimum length of the burst

This parameter is **TRD** (or **Δ TRD_P**) on the panel, in the Optimal Burst. This is the burst length compensation, which is optimised for each power control level. (Note that _P means that the parameter is a power compensation parameter).

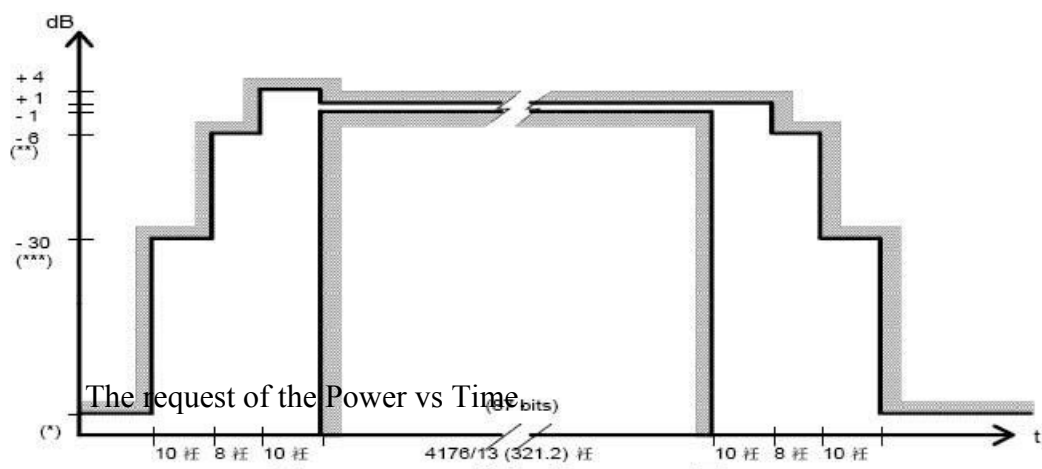
4 Operating mode

4.1 How to transmit a Tch burst (Random data), in GSM850/GSM900/DCS1800/PCS1900 mode, at power control level max:

Connect the mobile with a special software, Configuration of the common parameters:

- band: GSM850/GSM900/DCS1800/ PCS1900,
- channel: 192/661,
- RF level: PCL5/PCL0,

-Burst select: Mode Tch Random Press STAR command to start continuous TX, you can check the burst with CMU200 or Agilent 8960, it must fit the curve below.



4.2 How to stop Tx measurements: Press

STOP command to stop the TX..

4.3 How to transmit a burst after modifying parameters.

Please note that each time a parameter (such as parameter used to shape the burst) is changed, then the user have to: ” **Download to flash**” to validate the parameter modification. If the command is not performed, the old parameters are taken into account.

Tune-Up Frequency

5 Purpose

This panel gives the description of the Frequency plan. This window includes both:

- Automatic frequency control(AFC),
- Static frequency error and range,
- Dynamic frequency error and range

6 Automatic frequency control

Depending on the chosen 26 MHz Crystal and on the spread on the Crystal, the init voltage for the AFC command could change. On production line, on each handset, an initial frequency alignment procedure is done to compensate all components tolerances. In Case of DCXO implementation, 2 parameters are used for the Reference Clock alignment in order to guarantee a low frequency error at each switch-ON of the handset. This compensation is done by internal capacitors data bank of the BCM2093 that can be switched. One parameter called DCXO_CDAC defining the coarse initial frequency tuning by the 6 CDAC bits of the BCM2093. Second parameter called DCXO_CAFC defining the fine initial frequency tuning by the 14 CAFC bits of the BCM2093.

Table 1: Alignment parameter related to reference clock - Generic

Name	Description/Comments	Unit	Range	Value	Dyn	Dim	Comments
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Generic	DCXO_CDAC	Coarse Init voltage for the AFC command (coarse capacitor data bank)	LSB	2^8-1	Default is mid scale (*) 32d	1 byte	1
Generic	DCXO_CAFC	Fine Init voltage for the AFC command (fine capacitor data bank)	LSB	$2^{16}-1$	Default is mid scale (*) 8192d	2 bytes	1

General conditions:

Power supply is set to nominal battery voltage on VBAT. Switch ON the mobile in TAT mode.

Step1: DCXO_CDAC tuning (Coarse AFC)

- Switch the mobile in TX PCS (channel 661 level 15 for PCS).
- Measure the frequency error in TX Mode with a CMU200 (reference board radio tester)
- Calculate the DCXO_CDAC_(tuned) value
- Enter this value in the fixed parameter window: parameter DCXO_CDAC
- Save DCXO_CDAC_(tuned) value in EEPROM with the TAT software menu.
- Switch-OFF and switch-ON the mobile to validate the new value

Step2: DCXO_CAFC tuning (Fine AFC)

- Switch the mobile in TX PCS (channel 661 level 15 for PCS).
- Measure the frequency error in TX Mode with a CMU200 (reference board radio tester)
- Calculate the DCXO_CAFC_(tuned) value
- Enter this value in the fixed parameter window: parameter DCXO_CAFC
- Save DCXO_CAFC_(tuned) value in EEPROM with the TAT software menu.
- Switch-OFF and switch-ON the mobile to validate the new value

7 GPRS Data Transfer

GSM mobile phones use a Time Division Multiple Access (TDMA) scheme to transmit data. The TDMA format contains eight time slots. BCM2093 platform supports GPRS Class 33. When in GPRS mode the handset power amplifier typically transmits in one or two or three of these up time slots. To prevent interference between cell phones, the time mask profile as specified is very restricted. To meet the GSM time mask, the output power of the PA needs to ramp up and down very quickly while staying within the time mask and not generating extraneous frequency bursts due to too abrupt ramp profiles. As described before, the V_{ramp} input value sets the RF output power. By applying a certain ramp profile to the V_{ramp} pin, the power level (P_{out}) of the PA is set to obtain the required time mask. A time mask of the PA's output power is displayed in Figure 5. The time mask meets the limits (displayed by green lines) over a wide range of temperature, voltage and load variations.

8 Static frequency error and range

- Factors of static frequency error: manufacturing frequency tolerance in crystal at room temperature, aging, Static frequency error is compensated for using 6bits programming capacitor array (CAP ID).

The static frequency range of capacitor array (CAP ID=0 to 32) must be larger than 34ppm (±17ppm). The static range depends on crystal's TS and CL. The capacitor array calibration is done in production testing by setting the AFC DAC to mid-scale (8192) and adjusting CAP ID to the setting that gives closest to 0 ppm error (finish by test software). This CAP ID value is then stored in Flash memory and rewritten each time the VCXO is initialized.

GPRS Power

Numer of timeslots in uplink assignment	Permissible nominal reduction of maximum output power,(dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

Output Power

Max Target Power for Production Unit (dBm)			
Mode/Band	Channel		
	Low	Middle	High
GSM 850	32.00	32.00	32.00
GPRS 1 slot	31.50	31.50	31.50
GPRS 2 slot	28.30	28.30	28.30
GPRS 3 slot	27.00	27.00	27.00
GPRS 4 slot	25.00	25.00	25.00
PCS 1900	28.50	28.50	28.50
GPRS 1 slot	28.50	28.50	28.50
GPRS 2 slot	26.00	26.00	26.00
GPRS 3 slot	25.00	25.00	25.00
GPRS 4 slot	23.00	23.00	23.00
WCDMA850	23.00	23.00	22.50
WCDMA1900	22.30	22.30	22.30
WiFi	9.50	9.50	9.50
Bluetooth	9.00	9.00	9.00