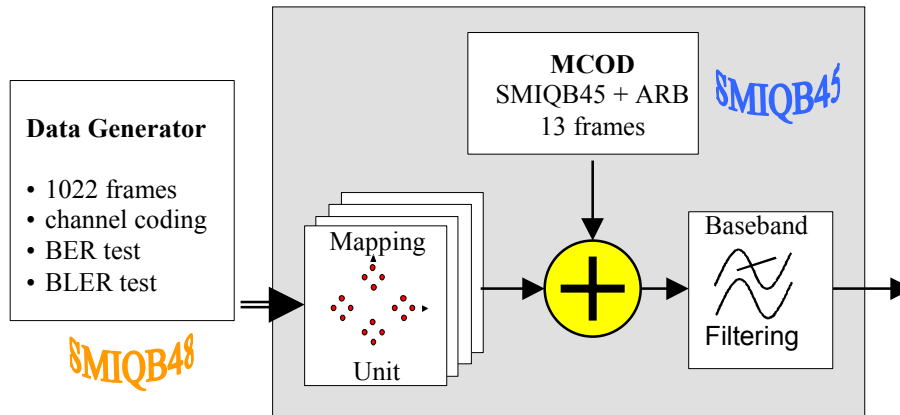


W-CDMA power settings in the reverse link

For the following considerations one block diagram as well as two power equations are the main part:



Block diagram: SMIQB45 and SMIQB48 functionality

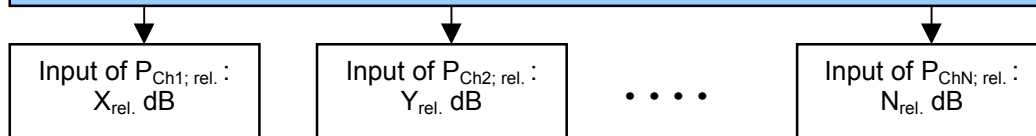
Logarithmic power: $\frac{P_{\log}}{\text{dBm}} = 10 \cdot \log \frac{P_{\text{lin}}}{1\text{mW}}$

Linear power: $\frac{P_{\text{lin}}}{\text{mW}} = 10^{\frac{P_{\log}}{10\text{dBm}}}$

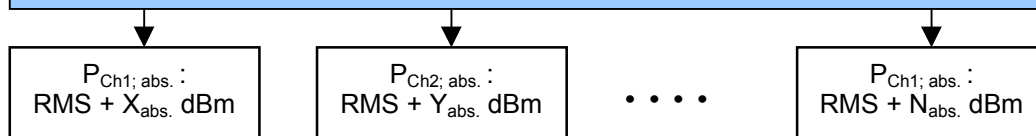
General procedure for W-CDMA channel power settings (up- and down link)

1. RMS level setting (the RMS power is never influenced by the following procedure)

2. Relative power settings of a channel scenario



3. ADJUST TOTAL POWER leads to absolute power of each channel



1

FREQ 2.000 000 000 0 GHz LEVEL -10.0 dBm

ALC-ON

FREQUENCY	PHS	STATE
LEVEL	IS95	SET DEFAULT <RESET>
ANALOG MOD	WCDMA	SAVE/RECALL SETTING...
VECTOR MOD	WCDMA/3GPP	TEST MODELS...
DIGITAL MOD	NADC	General Settings
DIGITAL STD	PDC	3GPP VERSION 4.1.0
ARB MOD	GSM/EDGE	CHIP RATE 3.84 Mcps
NOISE/DIST	DECT	SELECT BS/MS
FADING SIM	GPS	
BERT		
LF OUTPUT		

BS OF enter [SELECT] to execute function

Start with SET DEFAULT (main menu)

2

FREQ 2.000 000 000 0 GHz LEVEL -10.0 dBm

ALC-ON

FREQUENCY	PHS	General Settings
LEVEL	IS95	3GPP VERSION 4.1.0
ANALOG MOD	WCDMA	CHIP RATE 3.84 Mcps
VECTOR MOD	WCDMA/3GPP	LINK DIRECTION DOWN/FORWARD UP/REVERSE
DIGITAL MOD	NADC	SEQUENCE LENGTH 1 Frame
DIGITAL STD	PDC	CLIPPING LEVEL 100 %
ARB MOD	GSM/EDGE	FILTER... WCDMA 0.22
NOISE/DIST	DECT	SELECT BS/MS
FADING SIM	GPS	
BERT		
LF OUTPUT		

MS 1	MS 2	MS 3	MS 4
OFF	OFF	OFF	OFF

To get later on the DPDCH and DPCCH scenario select link direction UP/REVERSE

3

FREQ 2.000 000 000 0 GHz LEVEL -10.0 dBm

ALC-ON

FREQUENCY	PHS	3GPP VERSION
LEVEL	IS95	4.1.0
ANALOG MOD	WCDMA	CHIP RATE 3.84 Mcps
VECTOR MOD	WCDMA/3GPP	LINK DIRECTION DOWN/FORWARD UP/REVERSE
DIGITAL MOD	NADC	SEQUENCE LENGTH 1 Frame
DIGITAL STD	PDC	CLIPPING LEVEL 100 %
ARB MOD	GSM/EDGE	FILTER... WCDMA 0.22
NOISE/DIST	DECT	Assistant/Enhanced Functions
FADING SIM	GPS	SELECT BS/MS
BERT		
LF OUTPUT		

MS 1	MS 2	MS 3	MS 4
OFF	OFF	OFF	OFF

Select MS 1

!!! The RMS power of -10dBm is never influenced by the following procedure !!!

4

FREQ 2.000 000 000 0 GHz LEVEL -10.0 dBm

ALC-ON

MS 1 STATE	OFF	ON
MS MODE...	DPCCH+DPDCH	
SCRAMBLING CODE MODE...	LONG	
SCRAMBLING CODE	00 0000	H
TPC...	PATT	
TPC PATTERN	0	Bin
TPC PATTERN/DLIST READ OUT MODE...	CONTINUOUS	
DPCCH Settings		
POWER	0.0	dB
DL-UL TIMING OFFSET	1024	Chip
SLOT FORMAT	0 1 2 3 4 5	

Switch MS 1 STATE on
MS MODE... : DPCCH + DPDCH (is automatically set by SET DEFAULT (RESET) in step 1)

5

FREQ 2.000 000 000 0 GHz LEVEL -10.0 dBm

ALC-ON

DPCCH Settings		
POWER	-3.0	dB
DL-UL TIMING OFFSET	1024	Chip
SLOT FORMAT	0 1 2 3 4 5	
TFCI STATE	OFF	ON
TFCI	0	
FBI MODE	OFF	1_BIT 2_BIT
FBI	ALLO	ALL1 PATT
FBI PATTERN	0	Bin
MISUSE TPC FOR OUTPUT POWER CTRL	OFF	ON
TPC POWER STEP	0.0	dB

Example: The DPCCH channel should have doubled power of DPDCH
Adjust the DPCCH power to -3dB (in this menu plane the DPCCH as well as the DPDCH is calculated and stored by the SMIQB45; not enhanced !)

6

FREQ	2.000 000 000 0 GHz	LEVEL	-10.0 dBm
TPC POWER STEP		ALC-ON	
DPDCH Settings		0.0 dB	
ENHANCED CHANNELS...	OFF		
OVERALL SYMBOL RATE...	30 kSPS		
POWER PER DPDCH	-6.0 dB		
CHANNEL NUMBER	1	2	3
TYPE	DPDCH	4	5
SYMBOL RATE	30	6	
CHAN CODE	32		
DATA	PN15		

Make the power settings for the DPDCH on the left (-6dB). The power displays of DPCCCH and DPDCH are relative ones.
Hint: it is automatically one DPDCH channel with a symbol rate of 30 kbps adjusted by pressing SET DEFAULT in step 1 and activating the UP/REVERSE link in step 2.

7

FREQ	2.000 000 000 0 GHz	LEVEL	-10.0 dBm
WCDMA/3GPP		ALC-S&H	
FREQUENCY	PHS	STATE	OFF
LEVEL	IS95	SET DEFAULT (RESET)	ON
ANALOG MOD	WCDMA	SAVE/RECALL SETTING...	
VECTOR MOD	WCDMA/3GPP	TEST MODELS (NOT STANDARDIZED)	
DIGITAL MOD	NADC	3GPP VERSION	Calculating... 69 %
DIGITAL STD	PDC	CHIP RATE	0 Mcps
ARB MOD	GSM/EDGE	SELECT BS/MS	Break with (MOD ON/OFF)-key
NOISE/DIST	DECT	MS 1	MS 2
FADING SIM	GPS	ON	OFF
BERT		MS 3	MS 4
LF OUTPUT		OFF	OFF

Start the calculation of this scenario by pressing STATE on.

8

FREQ	2.000 000 000 0 GHz	LEVEL	-10.0 dBm
WCDMA/3GPP		ALC-S&H	
FREQUENCY	PHS	TRIGGER MODE...	RETRIG
LEVEL	IS95	EXECUTE TRIGGER	
ANALOG MOD	WCDMA	TRIGGER...	INT
VECTOR MOD	WCDMA/3GPP	CLOCK...	INT
DIGITAL MOD	NADC	EXT INPUTS...	1KQ/GND
DIGITAL STD	PDC	TOTAL POWER	-1.2 dB
ARB MOD	GSM/EDGE	ADJUST TOTAL POWER	
NOISE/DIST	DECT	SELECT BS/MS	
FADING SIM	GPS	MS 1	MS 2
BERT		ON	OFF
LF OUTPUT		MS 3	MS 4
		OFF	OFF

The TOTAL POWER of -1.2 dB is displayed.

Rel. power of DPCCCH: -3.0 dB

$$\Rightarrow P_{DPCCCH, \text{lin}} = 0.5$$

Rel. power of DPCCCH: -6.0 dB

$$\Rightarrow P_{DPDCH, \text{lin}} = 0.25$$

$$\Rightarrow P_{TOTAL, \text{lin}} = 0.75$$

$$\Rightarrow P_{TOTAL, \text{log}} = -1.2 \text{ dB}$$

9

FREQ	2.000 000 000 0 GHz	LEVEL	-10.0 dBm
WCDMA/3GPP		ALC-S&H	
FREQUENCY	PHS	TRIGGER MODE...	RETRIG
LEVEL	IS95	EXECUTE TRIGGER	
ANALOG MOD	WCDMA	TRIGGER...	INT
VECTOR MOD	WCDMA/3GPP	CLOCK...	INT
DIGITAL MOD	NADC	EXT INPUTS...	1KQ/GND
DIGITAL STD	PDC	TOTAL POWER	0.0 dB
ARB MOD	GSM/EDGE	ADJUST TOTAL POWER	
NOISE/DIST	DECT	SELECT BS/MS	
FADING SIM	GPS	MS 1	MS 2
BERT		ON	OFF
LF OUTPUT		MS 3	MS 4
		OFF	OFF

To make the evaluation of the absolute power of these two channels easier please press ADJUST TOTAL POWER

By pressing ADJUST TOTAL POWER the TOTAL POWER of this channel scenario is adjusted in a way that you get a TOTAL power of 0 dB (means $P_{TOTAL, \text{lin}} = 1$).

So the relative power of each active channel is increased by 1.2 dB.

10

FREQ	2.000 000 000 0 GHz	LEVEL	-10.0 dBm
WCDMA/3GPP		ALC-S&H	
DPCCCH Settings		-1.8 dB	
POWER	1024 Chip		
DL-UL TIMING OFFSET	0 1 2 3 4 5		
SLOT FORMAT	OFF ON		
TFCI STATE	0		
TFCI	OFF 1_BIT 2_BIT		
FBI MODE	ALLO ALL1 PATT		
FBI	0 Bin		
FBI PATTERN	OFF ON		
MISUSE TPC FOR OUTPUT POWER CTRL	0.0 dB		
TPC POWER STEP			

$$P_{DPCCCH, \text{log}} = -3 \text{ dB} + 1.2 \text{ dB} = -1.8 \text{ dB}$$

Abs. power of DPCCCH:
-10 dBm - 1.8 dB = -11.8 dBm

11

FREQ 2.000 000 000 0 GHz		LEVEL -10.0 dBm
		PEP -6.5 dBm
WCDMA/3GPP		ALC-S&H
TPC POWER STEP		0.0 dB
DPDCH Settings		
ENHANCED CHANNELS...		OFF
OVERALL SYMBOL RATE...		30 kSPS
POWER PER DPDCH		-4.8 dB
CHANNEL NUMBER	1	2
TYPE	DPDCH	
SYMBOL RATE	30	
CHAN CODE	32	
DATA	PN15	

$$P_{\text{DPDCH, log}} = -6 \text{ dB} + 1.2 \text{ dB} \\ = -4.8 \text{ dB}$$

Abs. power of DPDCH:
 $-10 \text{ dBm} - 4.8 \text{ dB} = -14.8 \text{ dBm}$

Hint: The RF power of this scenario has never changed (-10 dBm).

The complete scenario above is calculated and stored by the SMIQB45. For some special applications you need of course a increased sequence length (SMIQB45 maximum sequence length for W-CDMA: 13 frames; SMIQB48 up to 1022 frames, respectively 2044 frames) or more features like external power control, BER and BLER insertion. The SMIQB48 is the right choice, activated by the ENHANCED CHANNELS... mode.

12

FREQ 2.000 000 000 0 GHz		LEVEL -10.0 dBm
		PEP -6.5 dBm
WCDMA/3GPP		ALC-S&H
TPC POWER STEP		0.0 dB
DPDCH Settings		
ENHANCED CHANNELS...		OFF
OVERALL SYMBOL RATE...		30 kSPS
POWER PER DPDCH		-4.8 dB
CHANNEL NUMBER	1	2
TYPE	DPDCH	
SYMBOL RATE	30	
CHAN CODE	32	
DATA	PN15	

The settings of step 1 to 11 are not changed.

Scroll up and go into menu ENHANCED CHANNELS... and ...

13

FREQ 2.000 000 000 0 GHz		LEVEL -10.0 dBm
WARNING 281 Use <MOD ON/OFF>-key or switch on to recalculate;		
ENHANCED CHANNELS STATE		OFF <input checked="" type="checkbox"/>
Channel Coding		
CHANNEL CODING STATE		OFF <input type="checkbox"/> ON <input type="checkbox"/>
CODING TYPE...		MEASURE 12.2
INTERLEAVER 1		OFF <input type="checkbox"/> ON <input type="checkbox"/>
INTERLEAVER 2		OFF <input type="checkbox"/> ON <input type="checkbox"/>
DPDCH Bit Error Insertion		
INSERT BIT ERRORS IN DATA		OFF <input type="checkbox"/> ON <input type="checkbox"/>
NOMINAL BIT ERROR RATE		1.000 E-03
RESULTING BIT ERROR RATE DPDCH		0.000 E-03
External Power Control		

... switch it on (the W-CDMA signal generation is automatically switched off).

14

The sequence of screenshots shows the following steps:

- Screen 1:** Main menu with FREQ 2.000 000 000 0 GHz, LEVEL -10.0 dBm. The 'POWER DOWN RANGE' is 10.0 dB. The 'ENHANCED DPCCH STATE' is currently OFF.
- Screen 2:** After pressing 'menu up', the screen shows 'DPDCH Settings' with the 'ENHANCED DPCCH STATE' set to ON.
- Screen 3:** After pressing 'menu up' again, the screen shows 'DPDCH Settings (Enhanced)' with the 'ENHANCED DPCCH STATE' set to ON.
- Screen 4:** The final screen shows the 'ENHANCED DPCCH STATE' set to ON, with the 'POWER PER DPDCH' set to -4.8 dB.

The most important setting in this menu is the **ENHANCED DPCCH STATE** (please have also a look into online help of SMIQ).

ENHANCED DPCCH STATE off:

The DPCCH is calculated and stored by the SMIQB45 to save memory for the DPDCH on the SMIQB48 (on the left side a max. SEQUENCE LENGTH DPDCH of 1041 frames is possible).

One menu up the DPCCH power parameter is freely adjustable (because it is calculated and stored on the SMIQB45) whereas the DPDCH power is a read only parameter (Access for power settings via ENHANCED CHANNELS...).

ENHANCED DPCCH STATE on:

The DPCCH as well as the DPDCH are calculated and stored by the SMIQB48 (the DPCCH and DPDCH is signed with (Enhanced)). On the right side a max. SEQUENCE LENGTH DPDCH of 694 frames is possible.

The DPCCH as well as the DPDCH are now in read only mode for the power parameter (Access for power settings via ENHANCED CHANNELS...).

15

The screenshot shows the 'POWER DOWN RANGE' settings with the following values:

- FREQ: 2.000 000 000 0 GHz
- LEVEL: -10.0 dBm
- POWER DOWN RANGE: 10.0 dB
- SEQUENCE LENGTH DPDCH: 694 Frame
- OVERALL SYMBOL RATE...: 30 ksp/s
- POWER DPDCH: 0.0 dB
- ENHANCED DPCCH STATE: ON
- POWER DPCCH: 0.0 dB
- CHANNEL NUMBER: 1 E, 2 E, 3 E, 4 E, 5 E, 6 E
- TYPE: DPDCH
- SYMBOL RATE: 30

The following power settings are not influenced by the ENHANCED DPCCH STATE "ON" or "OFF": Make the settings on the left for the DPDCH and DPCCH (0 dB) in enhanced mode (ENHANCED DPCCH STATE "ON").

16

The screenshot shows the 'TOTAL POWER' settings with the following values:

- FREQ: 2.000 000 000 0 GHz
- LEVEL: -10.0 dBm
- PEP: -6.4 dBm
- DIGITAL MOD: PHS
- DIGITAL STD: IS95
- ARB MOD: WCDMA
- NOISE/DIST: WCDMA/3GPP
- FADING SIM: NADC
- BERT: PDC
- LF OUTPUT: GSM/EDGE
- SWEEP: DECT
- LIST: GPS
- MEM SEQ: UTILITIES
- TRIGGER MODE...: RETRIG
- EXECUTE TRIGGER: INT
- CLOCK...: INT
- EXT INPUTS...: 1KΩ/GND
- TOTAL POWER: +3.0 dB
- ADJUST TOTAL POWER: MS 1 ON, MS 2 OFF, MS 3 OFF, MS 4 OFF
- SELECT BS/MS: MS 1 ON, MS 2 OFF, MS 3 OFF, MS 4 OFF

The TOTAL POWER of this scenario is now + 3dB after the calculation of this signal.

Rel. power of DPCCH: 0 dB

$$\Rightarrow P_{DPCCH, lin} = 1$$

Rel. power of DPDCH: 0 dB

$$\Rightarrow P_{DPDCH, lin} = 1$$

$$\Rightarrow P_{TOTAL, lin} = 2$$

$$P_{TOTAL, log} = +3 \text{ dB}$$

17

FREQ 2.000 000 000 0 GHz		LEVEL -10.0 dBm	
		PEP -6.4 dBm	
WCDMA/3GPP ALC-S&H			
DIGITAL MOD	PHS	TRIGGER MODE...	RETRIG
DIGITAL STD	IS95	EXECUTE TRIGGER ▶	
ARB MOD	WCDMA	TRIGGER...	INT
NOISE/DIST	WCDMA/3GPP	CLOCK...	INT
FADING SIM	NADC	EXT INPUTS...	1KΩ/GND
BERT	PDC	TOTAL POWER	0.0 dB
LF OUTPUT	GSM/EDGE	ADJUST TOTAL POWER ▶	
SWEEP	DECT	SELECT BS/MS	
LIST	GPS		
MEM SEQ		MS 1	MS 2
UTILITIES		ON	OFF
		MS 3	MS 4
		OFF	OFF

By pressing ADJUST TOTAL POWER the TOTAL POWER of this channel scenario is adjusted in this way so you get out a TOTAL power of 0 dB (before + 3dB now 0 dB !). So the relative power of each active channel is decreased by 3 dB.

18

FREQ 2.000 000 000 0 GHz		LEVEL -10.0 dBm	
		PEP -6.4 dBm	
WCDMA/3GPP ALC-S&H			
POWER DOWN RANGE 10.0 dB			
Common Enhanced Channels Settings			
SEQUENCE LENGTH DPDCH	CURRENT MAX:	694 Frame	1 Frame
OVERALL SYMBOL RATE...			30 kSPS
POWER DPDCH			-3.0 dB
ENHANCED DPCCH STATE			OFF ON
POWER DPCCH			-3.0 dB
Specific Enhanced Channels Settings			
CHANNEL NUMBER	1 E	2 E	3 E
TYPE	DPDCH		
SYMBOL RATE	30		

$$P_{\text{DPCCH, log}} = 0 \text{ dB} - 3 \text{ dB} = -3 \text{ dB}$$

$$\text{Abs. power of DPCCH:} \\ -10 \text{ dBm} - 3 \text{ dB} = -13 \text{ dBm}$$

$$P_{\text{DPDCH, log}} = 0 \text{ dB} - 3 \text{ dB} = -3 \text{ dB}$$

$$\text{Abs. power of DPDCH:} \\ -10 \text{ dBm} - 4.8 \text{ dB} = -13 \text{ dBm}$$

Hint: The RF power of this scenario has never changed (-10 dBm).