

# Using the Code Domain Display of the SMIQB45

The code domain display of the SMIQ shows the occupancy of the code domain by the active code channels. This display shows at a glance whether assigned code domains of various channels overlap, i.e. whether a domain conflict occurs. The symbol rates of code channels are indicated by the width of the associated bars. The height of the bars gives the power of the code channel. If a bar is grey, the code domain at this position is assigned once which means that no conflicts occur. If a bar is black (at least partly), the code domain is assigned at least twice and conflicts occur.

The following text describes how to demonstrate the Code Domain Display of the SMIQB45 by using the Para. Predef Setting menu (Parameterized Predefined Setting).

## I. Channel setup using menu „Para. Predef Setting“

1

Frequency: 2.000 000 000 0 GHz, Level: -20.0 dBm

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

BS: enter [SELECT] to execute function

- Set frequency and level
- Go into the menu *DIGITAL STD* → *WCDMA/3GPP*
- Reset the 3GPP W-CDMA by selecting *SET DEFAULT (RESET)* ▶

2

Frequency: 2.000 000 000 0 GHz, Level: -20.0 dBm

FREQUENCY	PHS	LINK DIRECTION
LEVEL	IS95	DOWN/FORWARD UP/REVERSE
ANALOG MOD	WCDMA	SEQUENCE LENGTH
VECTOR MOD	WCDMA/3GPP	1 Frame
DIGITAL MOD	NADC	CLIPPING LEVEL
DIGITAL STD	PDC	100 %
ARB MOD	GSM/EDGE	FILTER...
NOISE/DIST	DECT	WCDMA 0.22
FADING SIM		Assistant/Enhanced Functions
BERT		PARA.PREDEF SETTING...
LF OUTPUT		ENHANCED CHANNELS BS1/MS1...
		OFF
		SELECT BS/MS

BS 1	BS 2	BS 3	BS 4
OFF	OFF	OFF	OFF

- Scroll down to the section “Assistant/Enhanced Functions”
- Select *PARA. PREDEF SETTING...*

3

Frequency: 2.000 000 000 0 GHz, Level: -20.0 dBm

FREQUENCY	PHS	LINK	CHANNELS FOR SYNC OF MOBILE
LEVEL	IS95	SEQUENCE	OFF ON
ANALOG MOD	WCDMA	S-CCPCH...	OFF kSPS
VECTOR MOD	WCDMA/3GPP	CLIPP NUMBER OF DPCH	4
DIGITAL MOD	NADC	FILTER SYMBOL RATE...	240 kSPS
DIGITAL STD	PDC	CREST...	WORST
ARB MOD	GSM/EDGE	PARA.	
NOISE/DIST	DECT	ENHANC	EXECUTE ▶
FADING SIM		SELEC	
BERT		BS	
LF OUTPUT		OF	

- Switch **OFF** the *CHANNELS FOR SYNC OF MOBILE* (“special channels” for synchronization: P-CPICH, P-SCH, S-SCH, P-CCPCH)
- Switch **OFF** the S-CCPCH
- Set the *NUMBER OF DPCH* to **4**
- Set the *SYMBOL RATE* to **240**
- Select the optimization criterium of the *CREST Factor* to **WORST**
- Select *EXECUTE* ▶ to finalize your entries

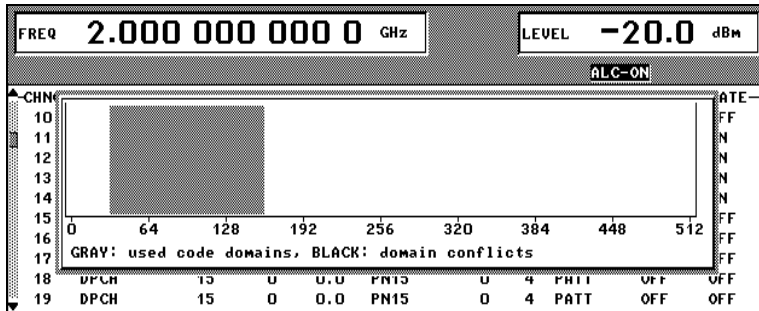
**After applying the settings your display should look like the picture on the left**

4

FREQ		2.000 000 000 0 GHz				LEVEL		-20.0 dBm		
ALC-ON										
CHNO	TYPE	SYM.RATE	CH.COD	POW/DB	DATA	TOFFS	PILOT	TPC	MC	STATE
10	DL-DPCCH	7.5	0	0.0				PATT		OFF
11	DPCH	240	1	0.0	PN15	0	4	PATT	OFF	ON
12	DPCH	240	2	0.0	PN15	0	4	PATT	OFF	ON
13	DPCH	240	3	0.0	PN15	0	4	PATT	OFF	ON
14	DPCH	240	4	0.0	PN15	0	4	PATT	OFF	ON
15	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
16	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
17	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
18	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
19	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF

- Go back into SMIQ's W-CDMA main menu by pressing the RETURN key on SMIQ's front panel
- By selecting *SELECT BS/MS* and BS 1 you will go into the channel table
- Scroll down until channel number 10 is on top of the display

5



- Press the *STATUS* key on the front panel of the SMIQ (This will activate the *CODE DOMAIN DISPLAY*)

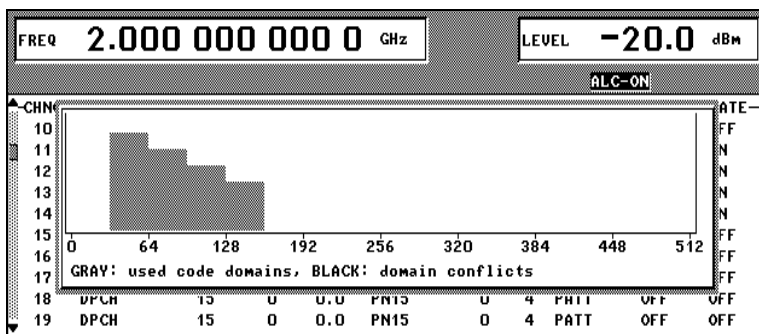
6

FREQ		2.000 000 000 0 GHz				LEVEL		-20.0 dBm		
ALC-ON										
CHNO	TYPE	SYM.RATE	CH.COD	POW/DB	DATA	TOFFS	PILOT	TPC	MC	STATE
10	DL-DPCCH	7.5	0	0.0				PATT		OFF
11	DPCH	240	1	-10.0	PN15	0	4	PATT	OFF	ON
12	DPCH	240	2	-20.0	PN15	0	4	PATT	OFF	ON
13	DPCH	240	3	-30.0	PN15	0	4	PATT	OFF	ON
14	DPCH	240	4	-40.0	PN15	0	4	PATT	OFF	ON
15	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
16	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
17	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
18	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
19	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF

- For a better differentiation of the channels press the *STATUS* key again and apply the following power settings for the channels:
- Set *POW/DB* for
  - channel 11 to -10
  - channel 12 to -20
  - channel 13 to -30
  - channel 14 to -40

**The SMIQ display should look like the picture on the left**

7



- Press the *STATUS* key on the front panel of the SMIQ
- The single channels are now clearly distinguishable

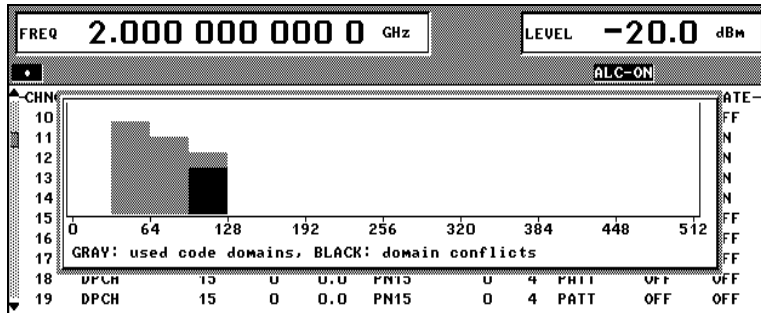
## II. Introducing a Code Domain Conflict

8

FREQ		2.000 000 000 0 GHz		LEVEL		-20.0 dBm		ALC-ON		
CHNO	TYPE	SYM.RATE	CH.COD	POW/DB	DATA	TOFFS	PILOT	TPC	MC	STATE
10	DL-DPCCH	7.5	0	0.0				PATT	OFF	OFF
11	DPCH	240	1	-10.0	PN15	0	4	PATT	OFF	ON
12	DPCH	240	2	-20.0	PN15	0	4	PATT	OFF	ON
13	DPCH	240	3	-30.0	PN15	0	4	PATT	OFF	ON
14	DPCH	240	3	-40.0	PN15	0	4	PATT	OFF	ON
15	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
16	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
17	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
18	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
19	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF

- Go back into the channel table and change the *CH.COD* (channelization code) for channel 14 to **3**
- The diamond between the *MC* and *STATE* field of the channel table as well as in the status line indicates a Code Domain Conflict

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- Press the *STATUS* key on the front panel of the SMIQ
- Black areas are indicating a Code Domain Conflict (here channel 13 and 14 are overlapping in the Code Domain due to same spreading factor at same data rate)

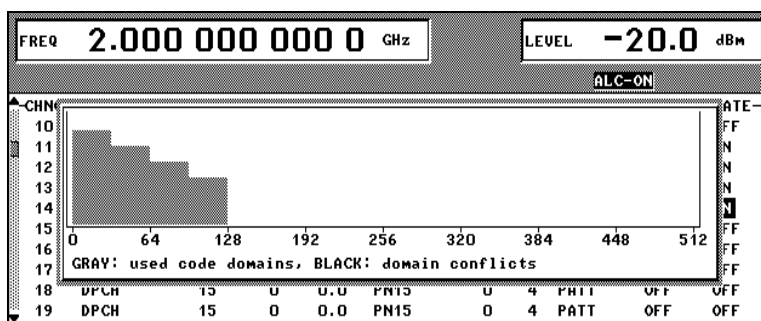
## III. Resolving the Code Domain Conflict

10

FREQ		2.000 000 000 0 GHz		LEVEL		-20.0 dBm		ALC-ON		
DOMAIN CONFLICT CHANNEL 14 versus CHANNEL 13										
1	CODE DOMAIN CHANNEL 14 [96..127]									
1	CODE DOMAIN CHANNEL 13 [96..127]									
1	RESOLVE ALL ▶									

- Press the *STATUS* key on the front panel of the SMIQ
- Choose the diamond with the cursor and press *SELECT* on the SMIQ front panel
- The SMIQ indicates the Code Domain Conflict between channel 13 and 14
- Press *SELECT* on the SMIQ front panel

11



- Press the *STATUS* key on the front panel of the SMIQ
- The Code Domain Conflict has been resolved. As you can see on the left, in comparison to picture 7, all channels got a new location in the code domain

12

FREQ		2.000 000 000 0 GHz		LEVEL		-20.0 dBm		ALC-ON		
CHNO	TYPE	SYM.RATE	CH.COD	POW/DB	DATA	TOFFS	PILOT	TPC	MC	STATE
10	DL-DPCCH	7.5	0	0.0				PATT	OFF	OFF
11	DPCH	240	0	-10.0	PN15	0	4	PATT	OFF	ON
12	DPCH	240	1	-20.0	PN15	0	4	PATT	OFF	ON
13	DPCH	240	2	-30.0	PN15	0	4	PATT	OFF	ON
14	DPCH	240	3	-40.0	PN15	0	4	PATT	OFF	ON
15	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
16	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
17	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
18	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
19	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF

- Press the *STATUS* key on the front panel of the SMIQ
- The SMIQ tries to arrange the codes from left to right, as you can see in the graphical display (picture 11 compared to picture 7) as also in the channel table (compare to picture 6)

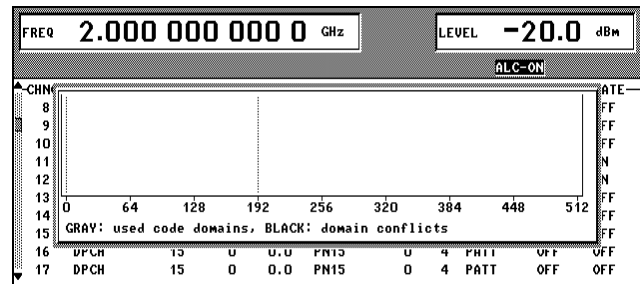
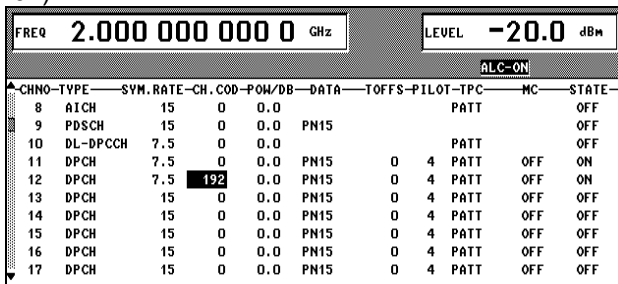
## IV. Relationship between Symbol rate, Channelization Code and Code Domain Display

In the 3GPP WCDMA system the overall chip rate is 3.84 Mcps. The minimum possible symbol rate for one code channel is 7.5 kbps. The maximum number of channelization codes (spreading factors) can be calculated by dividing the overall chip rate by the minimum possible symbol rate, which leads to 512 possible channelization codes for a 7.5 kbps data channel.

If the symbol rate for a code channel goes up, the maximum number of channelization codes goes down.

Symbol rate / kbps	Maximum number of channelization codes	Factor compared to 7.5 kbps channel
7.5	512	1
15	256	2
30	128	4
60	64	8
120	32	16
240	16	32
480	8	64
960	4	128

This means, that a channel with a symbol rate of 240 kbps is occupying 32 times more space in the code domain as a 7.5 kbps channel. In the code domain display you will find on the x-axis the code domain. For a 7.5 kbps channel this directly applies (A channel with a symbol rate of 7.5 kbps and a channelization code 0 will be displayed exactly at 0, the same channel with channelization code 192 will be displayed at position 192).



A channel with a symbol rate of 240 kbps and a channelization code of 0 will occupy the code domain region from 0 to 32. The same channel displayed from 192 to 224 will have a channelization code of 192 divided by 32 = 6.

