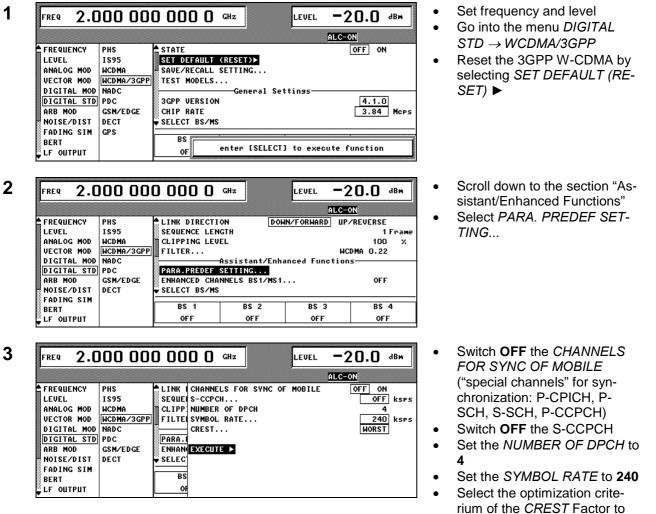
Using the Code Domain Display of the SMIQB45

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"



SMIQ Getting Started

Code Domain Display

WORST

ture on the left

your entries

Select EXECUTE ► to finalize

After applying the settings your display should look like the pic-

4	FREQ	2.00	0 0 0 0	0 0	<u>)0 0</u>	GHz		LE	VEL .	-20.0] dBm
							1	·	AL	LC-ON	
	CHNO-	-TYPESY	M.RATE-C	H. COD	-POW/DE	DATA-	-TOFFS-	PILO	T-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
5	FREQ	2.00	חחח ה	ח ח	ח חר	GHz		LE	VEL .	-20.0	d Bm
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	CHN€								<u></u>		ATE-
	10										FF
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	11										N
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	11 12 13 14									_	N N N
	11 12 13 14 15	0 64	128	1	92	256	320	384	4 4	148 5	N N FF
	11 12 13 14 15 16	Ó 6'4 GRAY: used							4 4	148 5	N N 12 FF
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	11 12 13 14 15 16 17			mains				cts	4 4 Phii Patt	148 5 0FF 0FF	N N 12 FF
	11 12 13 14 15 16 17 18	GRAY: used	ob eboo Gr	mains. U	BLACK	domai	in confli U	cts 4	гніі	VFF	N N 12 FF FF VFF
5	11 12 13 14 15 16 17 18	GRAY: used DPCH DPCH	code do 15	umains U O	0.0	PN15	in confli U	cts 4 4	PHII PATT	OF F OF F	N N FF 12 FF FF OFF
6	11 12 13 14 15 16 17 18 ▼ 19	GRAY: used	code do 15	umains U O	0.0	PN15	in confli U	cts 4 4	PHII PATT	0FF 0FF -20.0	N N FF 12 FF FF OFF
5	11 12 13 14 15 16 17 18 ▼ 19	GRAY: used DPCH DPCH	code do 13 15	0 0 0 0	0.0 0.0	i domai PN15 PN15 GHz	in confli U	4 4 LE	PHTT PATT VEL	OF F OF F	N N FF 12 FF FF OFF
6	11 12 13 14 15 16 17 18 ▼ 19 FREQ	GRAY: used DPCH DPCH	code do 13 15	0 0 0 0	0.0 0.0	i domai PN15 PN15 GHz	in confli U O	4 4 LE	PHTT PATT VEL	OFF OFF -20.0	N N N FF FF OFF OFF
6	11 12 13 14 15 16 17 18 ▼ 19 ▼	GRAY: used UPCH DPCH 2.000	code do 13 15 D OOI	mains 0 0 0 0 0 0 0	-POW/DE	i domai PN15 PN15 GHz	in confli U O	4 4 LE	PHTT PATT VEL AL	OFF OFF -20.0	N N N F F F F F F F F F F F F F F F F F
6	■ 11 12 13 14 15 16 17 18 ■ 19 ▼ 19	GRAY: used DPCH DPCH 2.000 -TYPE DL-DPCCH	code do 13 15 D O O O	Mains 0 0 0 0 0 0 0 0 1	BLACK 0.0 0.0	GHz	in confli U U U U U U U U U U U U U U U U U U U	ets 4 4 LE	PHTT PATT VEL AL T-TPC- PATT	OFF -20.0 	N N 12 FF FF OFF OFF OFF
6	■ 11 12 13 14 15 16 17 18 ▼ 19 ▼ 19 ▼ FREQ ■ CHNO- 10 ■ 11	GRAY: used DPCH 2.000 TYPE DL-DPCCH DPCH	code do 13 15 D O O O M. RATE-C 7.5 240	CH.COD	ВLАСК 0.0 0.0 ОООООООООООООООООООООООООООООО	: domai PN13 PN15 GHz :DATA- PN15	in confli U U U U U U U U U U U U U U U U U U U	ets 4 LE	PHII PATT VEL I I T-TPC- PATT PATT	OFF -20.0 LC=ON MC	J N N FF FF OFF OFF OFF OFF
6	■ 11 12 13 14 15 16 17 18 ■ 19 FREQ ● CHNO- 10 11 11 12	GRAY: used DPCH 2.000 -TYPE	code do 13 15 D O O O M. RATE-C 7.5 240 240	CH.COD	BLACK 0.0 0.0 0.0 0.0 -POH/DB 0.0 -10.0 -20.0	: domai PN13 PN15 GHz 	in confli U U TOFFS- 0 0	cts 4 4 LE	PHII PATT VEL IT-TPC- PATT PATT PATT	OFF -20.0 LG=ON MC OFF OFF	B A A A A A A A A A A A A A
6	■ 11 12 13 14 15 16 17 18 ▼ 19 FREQ ● CHNO- 10 11 11 12 13	GRAY: used DPCH 2.001 -TYPE SY DL-DPCCH DPCH DPCH	code do 13 15 D O O O M. RATE-(7.5 240 240 240 240	CH. COD 0 1 2 3	- BLACK 0.0 - 0.0 - 00 - 10.0 - 20.0 - 30.0	: domai PN13 PN15 GHz 	TOFFS-	LE LE PILO	PHII PATT VEL T-TPC- PATT PATT PATT PATT	OFF OFF -20.0 LC=ON MC OFF OFF OFF	A BM A BM
6	■ 11 12 13 14 14 15 16 17 18 • 19 • 19 • FREQ • CHNO- 10 11 12 13 13 14	GRAY: used DPCH DPCH -TYPE -TYPE DL-DPCCH DPCH DPCH DPCH	code do 13 15 0 000 M.RATE-(7.5 240 240 240 240	U 0 0 0 0 0 0 0 0 0 0 0 0 1 2 3 4	- BLACK 0.0 - 0.0 - 10.0 - 20.0 - 30.0 40.0	GHz GHz GHz PN15 PN15 PN15 PN15 PN15 PN15	in confli 0 TOFFS- 0 0 0 0	cts 4 4 LE ¹ PIL0 4 4 4	PHTT PATT UEL IT-TPC- PATT PATT PATT PATT PATT	OFF OFF -20.[.c-on MC OFF OFF OFF	J dBm -STATE- OFF OFF ON ON ON
6	■ 11 12 13 14 15 16 17 18 ■ 19 ▼ 19 ▼ FREQ ■ CHNO- 10 10 11 12 13 14 15	GRAY: used DPCH 2.000 TYPE DL-DPCCH DPCH DPCH DPCH DPCH	code do 13 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	U 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	- BLACK 0.0 - 0.0 - 10.0 - 20.0 - 30.0 - 40.0 0.0	: domai PN15 PN15 GHz 	in confli 0 	cts 4 4 PIL0 4 4 4 4	PHTT PATT UEL T-TPC- PATT PATT PATT PATT PATT PATT	OFF OFF -20.0 CC-ON MC- OFF OFF OFF OFF	dBm -STATE- OFF OFF OFF ON ON ON OFF
6	■ 11 12 13 14 15 16 17 18 ■ 19 ▼ 19 ▼ 19 ▼ 19 ▼ 19 ▼ 19	GRAY: used DPCH DPCH TYPE DL-DPCCH DPCH DPCH DPCH DPCH DPCH DPCH	Code do 13 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	mains 0 0 0 0 0 0 0 1 2 3 4 0 0	- BLACK 0.0 0.0 -POW/DB 0.0 -10.0 -20.0 -30.0 -30.0 0.0 0.0	: domai PN15 PN15 PN15 CHz CHz PN15 PN15 PN15 PN15 PN15 PN15	in confli 0 	cts 4 4 PIL0 4 4 4 4 4 4	PHIT PATT UEL T-TPC- PATT PATT PATT PATT PATT PATT PATT	OFF OFF -20.C -20.C 	M N FF OFF OFF OFF OFF ON ON ON ON OFF OFF
6	■ 11 12 13 14 15 16 17 18 ■ 19 ▼ 19 ▼ 19 ▼ 19 ▼ 19 ▼ 19 ▼ 19 ▼ 19 ▼	GRAY: used DPCH DPCH TYPE TYPE DL-DPCCH DPCH DPCH DPCH DPCH DPCH DPCH DPCH	code do 13 15 M. RATE-C 7.5 240 240 240 240 240 15 15	Mains 0 0 0 0 0 0 1 2 3 4 0 0 0	- BLACK 0.0 0.0 -0.0 -10.0 -20.0 -30.0 -40.0 0.0 0.0 0.0	: domai PN13 PN13 PN15 PN15 PN15 PN15 PN15 PN15 PN15 PN15	in confli 0 	cts 4 4 PIL0 4 4 4 4 4 4 4 4	PHTT PATT UEL T-TPC- PATT PATT PATT PATT PATT PATT PATT PAT	OFF OFF -20.0 MC OFF OFF OFF OFF OFF OFF	A BM A BM

7

FREQ	2.00	0 00	0 00	00 сна	z	LEV		20.0	dBm
							ALC	<u>-0N</u>	
2HN 10									
11									N
12									N
14 15	Ļ								N FF
16	O 64 GRAY: use	128 //		256 BLACK: doe	320	384 Liota	44	8 512	FF
17						4	PHII	117	FF
19	DPCH	15	-	0.0 PN1		4	PATT	OFF	OFF

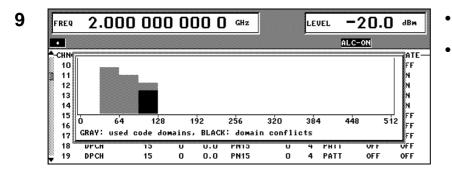
- Go back into SMIQ's W-CDMA main menu by pressing the RETURN key on SMIQ's front panel
- By selecting SELECT BS/MS and BS 1 you will go into the channel table
 - Scroll down until channel number 10 is on top of the display
- Press the STATUS key on the front panel of the SMIQ (This will activate the CODE DO-MAIN DISPLAY)
- 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

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

II. Introducing a Code Domain Conflict

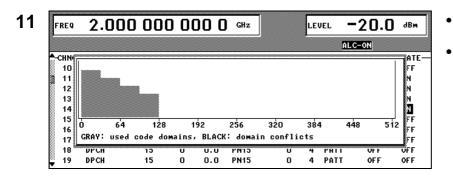
				_			1				
FR	EQ	2.000	000	U	00 0	GHz		LE	VEL '	-20.0	dBm
•	1							<u> </u>	A	LC-ON	
-CI	INO-T	YPE-SYM	RATE-CH.	COL	-POW/DB	-DATA-		ILO	T-TPC-	MC	-STATE
1	10	DL-DPCCH	7.5	0	0.0				PATT		OFF
i 1	11	DPCH	240	1	-10.0	PN15	0	4	PATT	OFF	ON
1	12	DPCH	240	2	-20.0	PN15	0	4	PATT	OFF	ON
1	13	DPCH	240	3	-30.0	PN15	0	4	PATT	OFF	ON
1	14	DPCH	240	3	-40.0	PN15	0	4	PATT	OFF	ON
1	15	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
1	16	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
1	17	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
1	18	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF
8 1	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**
- 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

FR	EQ	2.00	0 00	0	000	O GHz		LEVE		-20.0	
•								,	Ê	LC-ON	
A-CH	DOMA	IN CON	LICT CH	ANNEL	14 ver	sus CHA	NNEL 1	3			
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1	CODE	DOMAIN	I CHANNE	L 13	[96	1271					
1											
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12	FREQ	2.000) ()
	-CHNO	-TYPESY	M.RAT
	10	DL-DPCCH	7.5
	11	DPCH	240
	12	DPCH	240
	13	DPCH	240

REQ	2.000	<u>) 00</u>	00	<u>00 C</u>	GHz		LE	VEL -	-20.0] dBm
							_	AL	C-ON	
CHNO-	-ТҮРЕ	M.RATE-	CH.COL	-POW/DE	-DATA-	TOFFS-	ILO	Т-ТРС-	MC-	-STATE
10	DL-DPCCH	7.5	0	0.0				PATT		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
- 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
- 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
- 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 ksps. 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 ksps data channel.

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

Symbol rate / ksps	Maximum number of channelization codes	Factor compared to 7.5 ksps 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 ksps is occupying 32 times more space in the code domain as a 7.5 ksps channel. In the code domain display you will find on the x-axis the code domain. For a 7.5 ksps channel this directly applies (A channel with a symbol rate of 7.5 ksps and a channelization code 0 will be displayed exactly at 0, the same channel with channelization code 192 will be displayed at position 192).

FREQ	2.000) OO C	0 00)O O	GHz		LE	VEL -	-20.0) dBm	FREQ	2.	000) 00 C) 0(<u>)0 C</u>	GHz		LE	VEL •	-20	О ав
-CHNO.	-TYPESY	N PATE-	CH COD-	-ROU/DR					C-ON MC	-STATE-	€-CHN€									AL	<u>C-ON</u>	
8	AICH	15	0	0.0		10113-1	ILV	PATT	nc	OFF	8											FI
9 10	PDSCH DL-DPCCH	15 7.5	0 0	0.0 0.0	PN15			PATT		OFF OFF	9											FI
11	DPCH	7.5	Ō	0.0	PN15	0	4	PATT	OFF	ON	11											Ν
12 13	DPCH DPCH	7.5	192 0	0.0 0.0	PN15 PN15	0 0	4	PATT PATT	OF F OF F	ON OFF	12 13	Ļ							-			
14	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF	14	U GRAY:	64 used	128 code do		92 BLACK	256 : domai	320 n confli	384 cts	+ 4	48	512 FI
15 16	DPCH DPCH	15 15	0 0	0.0 0.0	PN15 PN15	0 0	4	PATT PATT	OFF OFF	OFF OFF	15 16	VPCH		10	U	0.0	PN10	U	4	rhi i	117	VFI
17	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF	1 7	DPCH		15	0	0.0	PN15	0	4	PATT	OFF	OFI

A channel with a symbol rate of 240 ksps 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.

CHNO-TYPE SYM. RATE-CH. COD-POM/DB-DATA TOFFS-PILOT-TPC MC STATE- 8 AICH 15 0 0.0 PATT OFF 8 9 PDSCH 15 0 0.0 PATT OFF 9 10 DL-OPCCH 7.5 0 0.0 PATT OFF 9 11 DPCH 240 0 0.0 PN15 O FF 9 10 12 DPCH 240 0 0.0 PN15 0 6 PATT OFF 11 13 DPCH 15 0 0.0 PN15 4 PATT OFF 13 14 DPCH 15 0 0.0 PN15 4 PATT OFF 14 15 D 0.0 PN15 4 PATT OFF 14 0 64 128 192 256 320 394 448 512 FF 15	FREQ	2.000	00 (0 00	<u>)0 O</u>	GHz		LEV	EL	-20.0	dBm	FR	EQ	2.00	0 0	DO	000) ()	GHz		LE	VEL	-2	0.0	dBm
16 DPCH 15 0 0.0 PN15 0 4 PATT OFF OFF 16 DPCH 13 U U.U PN13 U 4 PHIL VEF OFF	8 9 10 11 12 13 14 15	-TYPESYI AICH PDSCH DL-DPCCH DPCH DPCH DPCH DPCH DPCH	M.RATE- 15 7.5 240 240 15 15 15	CH . COD- 0 0 0 0 0 0 0 0	-POW/DB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0		0 0 0 0	16 16 4 4 4	-TPC PATT PATT PATT PATT PATT PATT PATT	MC OFF OFF OFF OFF OFF	OFF OFF OFF ON ON OFF OFF		8 9 10 11 12 13 14 15	GRAY: used	l code	domai	ins, B	LACK	: domair	n confl		4	448	51:	FF