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Accredited testing laboratory

DAR registration number: DAT-P-176/94-D1

Test report no. : 2-4883-58-05/08
Type identification : AAD-3880002-BV
Test specification : IEEE 1528-2003
FCC-ID : PY7A3880002
IC-ID : 4170B-A3880002

Table of Contents

1 General Information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

1.1.1 Background information

This test report is an addendum to Sony Ericsson SAR test report BGLI08:899 on the AAD-3880002-BV GSM/UMTS mobile phone. It consists of conducted power measurements in HSUPA mode to show correct implementation of maximum power reduction in different HSUPA sub-tests.

Test engineer:

2008-11-06	**Oleksandr Hnatovskiy**	
Date	Name	Signature

Technical responsibility for area of testing:

2008-11-06	**Thomas Vogler**	
Date	Name	Signature

1.2 Testing laboratory

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State of accreditation: The Test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025. DAR registration number: DAT-P-176/94-D1

Test location, if different from CETECOM ICT Services GmbH

Name: ---
Street: ---
Town: ---
Country: ---
Phone: ---
Fax: ---

1.3 Details of applicant

Name: Sony Ericsson Mobile Communications AB

Street: Mobilvägen 10
Town: 22188 Lund
Country: Sweden

Contact: Mr. Peter Lindeborg
Telephone: +46-10-802-43 68

1.4 Application details

Date of receipt of application: 2008-11-06
Date of receipt of test item: 2008-11-06
Start/Date of test: 2008-11-06
End of test:

Person(s) present during the test: ---

1.5 Test item

Description of the test item:	GSM/UMTS Mobile Phone
Type identification:	AAD-3880002-BV
FCC-ID :	PY7A3880002
IC-ID :	4170B-A3880002
Serial number:	GT2000046

Manufacturer:	
Name:	Sony Ericsson Mobile Communications AB
Street:	Mobilvägen 10
Town:	22188 Lund
Country:	Sweden

additional information on the DUT:		
device type :	portable device	
exposure category:	uncontrolled environment / general population	
test device production information	production unit	
device operating configurations :		
operating mode(s)	GSM, DCS, PCS, UMTS/WCDMA, WLAN, Bluetooth	
modulation	GMSK, 8-PSK, 2*BPSK/HPSK(ul), DSSS, OFDM	
GPRS mobile station class :	B	
GPRS multislot class :	10	voice mode : ---
EGPRS multislot class	10	voice mode : ---
maximum no. of timeslots in uplink:	2	
operating frequency range(s)	transmitter frequency range	receiver frequency range
PCS 1900	1850.2 MHz ~ 1909.8 MHz	1930.2 MHz ~ 1989.8 MHz
PCS 850	824.2 MHz ~ 848.8 MHz	869.2 MHz ~ 893.8 MHz
DCS 1800	1710 MHz ~ 1785 MHz	1805 MHz ~ 1880 MHz
GSM 900	880 MHz ~ 915 MHz	925 MHz ~ 960 MHz
FDD I	1922.4 MHz ~ 1977.6 MHz	2112.4 MHz ~ 2167.6 MHz
FDD II (tested conducted power)	1852.4 MHz ~ 1907.6 MHz	1932.4 MHz ~ 1987.6 MHz
FDD V (tested conducted power)	826.4 MHz ~ 846.6 MHz	871.4 MHz ~ 891.6 MHz
Power class :	1, tested with power level 0 (1900 MHz band) 4, tested with power level 5 (850 MHz band) 3; (FDD II band), (FDD V band)	
measured averaged peak output power (conducted):	FDD II band: 24.2 dBm; FDD V: 23.4 dBm (RMS max.)	
test channels (low-mid-high) :	9262-9400-9538 (FDD II band) 4132-4182-4233 (FDD V band)	
hardware / software version :	PQ1 / R1AA006	
antenna type :	Integrated antenna	
battery options :	Sony Ericsson Battery BST-41 Li-Polymer 3.6V 1500mAh	

1.6 Test specification(s)

Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01)

IEEE 1528-2003 (April 21, 2003)

RSS-102: Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands (Issue 2 of November 2005)

Canada's Safety Code 6: Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz (99-EHD-237)

IEEE Std C95.3 – 1991, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave.

IEEE Std C95.1 – 1999, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.

1.6.1 RF exposure limits

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR* (Brain)	**1.60 mW/g**	8.00 mW/g
Spatial Average SAR** (Whole Body)	0.08 mW/g	0.40 mW/g
Spatial Peak SAR*** (Hands/Feet/Ankle/Wrist)	4.00 mW/g	20.00 mW/g

Table 1: RF exposure limits

The limit applied in this test report is shown in **bold** letters

Notes:

* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

** The Spatial Average value of the SAR averaged over the whole body.

*** The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

2 Technical test

2.1 Summary of test results

This test report only covers a part of SAR test requirements.
Final results see Sony Ericsson test report BGLI08:899

2.2 Test environment

General Environment conditions in the test area are as follows:

Ambient temperature: 20°C – 24°C
Tissue simulating liquid: 20°C – 24°C
Humidity: 40% – 50%

2.3 Measurement and test set-up

The measurement system is described in chapter 2.4.

A description of the test signal control can be found in chapter 2.5 together with the test results.

2.4 Measurement system

The following equipment has been used to perform conducted power measurements :

	Manufacturer	Device	Type	Serial number	Date of last calibration
☒	Rohde & Schwarz	Universal Radio Communication Tester	CMU 200	832221/055	March 20, 2008

2.5 Test Results

2.5.1 Conducted power measurements

Conducted power measurements were performed a short adapter cable to connect the DUT to the CMU200

2.5.2 Conducted power measurements WCDMA FDD V (850 MHz)

Max. RMS output power 850 MHz (FDD V) / dBm			
	Channel / frequency		
mode	4132 / 826.4 MHz	4182 / 836.6 MHz	4233 / 846.6 MHz
RMC 12.2 kbit/s	**23.36**	**23.27**	**23.38**
HSUPA Sub test 1	22.98	22.87	22.83
HSUPA Sub test 2	20.85	20.78	20.92
HSUPA Sub test 3	21.84	21.72	21.67
HSUPA Sub test 4	20.94	21.05	21.03
HSUPA Sub test 5	**23.02**	**23.06**	**22.94**

Table 2: Test results conducted peak power measurement WCDMA 850

2.5.3 Conducted power measurements WCDMA FDD II (1900 MHz)

Max. RMS output power 1900 MHz (FDD II) / dBm			
	Channel / frequency		
mode	9262 / 1852.4 MHz	9400 / 1880.0 MHz	9538 / 1907.6 MHz
RMC 12.2 kbit/s	**24.07**	**24.05**	**24.16**
HSUPA Sub test 1	23.22	23.16	23.18
HSUPA Sub test 2	21.27	21.21	21.24
HSUPA Sub test 3	21.81	21.97	21.96
HSUPA Sub test 4	21.57	21.51	21.54
HSUPA Sub test 5	**23.18**	**23.23**	**23.21**

Table 3: Test results conducted peak power measurement WCDMA 1900

Remark : None of the HSUPA settings leads to conducted power values exceeding the conducted power in RMC mode by more than 0.25 dB, so that no additional SAR measurements are needed in HSUPA mode.

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2.5.4 Test-set-up information for HSUPA

In HSUPA mode additional code channels (E-DPCCH, E-DPDCHn) are added for data transfer in uplink at higher bit rates.

5 sub-tests are defined by 3GPP 34.121 according to the following table :

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ec} (SF)	β_{ed} (code)	CM (2) (dB)	MPR (dB)	AG (4) Index	E-TFCI
1	11/15 (3)	15/15 (3)	64	11/15 (3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 β_{ed2}:47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (4)	15/15 (4)	64	15/15 (4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK}, Δ_{CQI} = 8 $\Leftarrow\Rightarrow$ A_{hs} = β_{hs}/β_c = 30/15 $\Leftarrow\Rightarrow$ β_{hs} = 30/15 * β_c
Note 2 : CM = 1 for β_c/β_d = 12/15, β_{hs}/β_c = 24/15. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference
Note 3 : For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to β_c = 10/15 and β_d = 15/15
Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to β_c = 14/15 and β_d = 15/15
Note 5 : Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g
Note 6 : β_{ed} can not be set directly; it is set by Absolute Grant Value

Table 4: Subtests for UMTS Release 6 HSUPA

To achieve the settings above some additional procedures were defined by 3GPP 34.121. Those have been included in an application note for the CMU200 and were exactly followed :

- Test mode connection (BS signal tab) :
  RMC 12.2 kbit/s + HSPA 34.108 with loop mode 1
- HS-DSCH settings (BS signal tab):
  - FRC with H-set 1 QPSK
  - ACK-NACK repetition factor = 3
  - CQI feedback cycle = 4ms
  - CQI repetition factor = 2
- HSUPA-specific signalling settings (UE signal tab) :
  - E-TFCI table index = 0
  - E-DCH minimum set E-TFCI = 9
  - Puncturing limit non-max = 0.84
  - max. number of channelisation codes = 2x SF4
  - Initial Serving Grant Value = Off
- HSDPA and HSUPA Gain factors (UE signal tab)

Sub-test	β_c	β_d	Δ_{ACK}, Δ_{NACK}, Δ_{CQI}	ΔE–DPCCH)*
1	10	15	8	6
2	6	15	8	8
3	15	9	8	8
4	2	15	8	5
5	14	15	8	7

)* : β_{ec} and β_{ed} ratios (relative to β_c and β_d) are set by ΔE–DPCCH

- HSUPA Reference E-TFCIs (UE signal tab > HSUPA gain factors) :

Sub-test	1, 2, 4, 5				
Number of E-TFCIs	5				
Reference E-TFCI	11	67	71	75	81
Reference E-TFCI power offset	4	18	23	26	27

Sub-test	3	
Number of E-TFCIs	2	
Reference E-TFCI	11	92
Reference E-TFCI power offset	4	18

- HSUPA-specific generator parameters (BS Signal tab > HSUPA > E-AGCH > AG Pattern)

Sub-test	**Absolute Grant Value (AG Index)**
1	20
2	12
3	15
4	17
5	21

- Power Level settings (BS Signal tab > Node B-settings):
  - Level reference : Output Channel Power (lor)
  - Output Channel Power (lor) : -86 dBm

- Downlink Physical Channel Settings (BS signal tab)
  - P-CPICH : -10 dB
  - S-CPICH : Off
  - P-SCH : -15 dB
  - S-SCH : -15 dB
  - P-CCPCH : -12 dB
  - S-CCPCH : -12 dB
  - PICH : -15 dB
  - AICH : -12 dB
  - DPDCH : -10 dB
  - HS-SCCH : -8 dB
  - HS-PDSCH : -3 dB
  - E-AGCH : -20 dB
  - E-RGCH/E-HICH - 20 dB
  - E-RGCH Active : Off

The settings above were stored once for each sub-test and recalled before the measurement.

2.5.5 HSUPA test procedure :

To reach maximum output power in HSUPA mode the following procedures were followed:

3 different TPC patterns were defined :
Set 1 : Closed loop with target power 10 dBm
Set 2 : Single Pattern+Alternating with binary pattern '11111' for 1 dB steps 'up'
Set 3 : Single Pattern+Alternating with binary pattern '00000' for 1 dB steps 'down'

After recalling a certain HSUPA sub-test the HSUPA E-AGCH graph with E-TFCI event counter is displayed. After starting with the closed loop command the power is increased in 1 dB steps by activating pattern set 2 until the UE decreases the transmitted E-TFCI.
At this point set 3 is activated once to reduce the output power to the value at which the original E-TFCI, which is required for the sub-test, appears again.

For conducted power measurements the same steps are repeated in the power menu to read out the corresponding maximum RMS output power with the target E-TFCI.
For SAR measurements it is useful to switch to Code Domain Power vs. Time display.
Here the CMU200 shows relative power values (max. and min.) of each code channel which should roughly correspond to the numerators of the subtest gain factors multiplied with 15

e.g. :

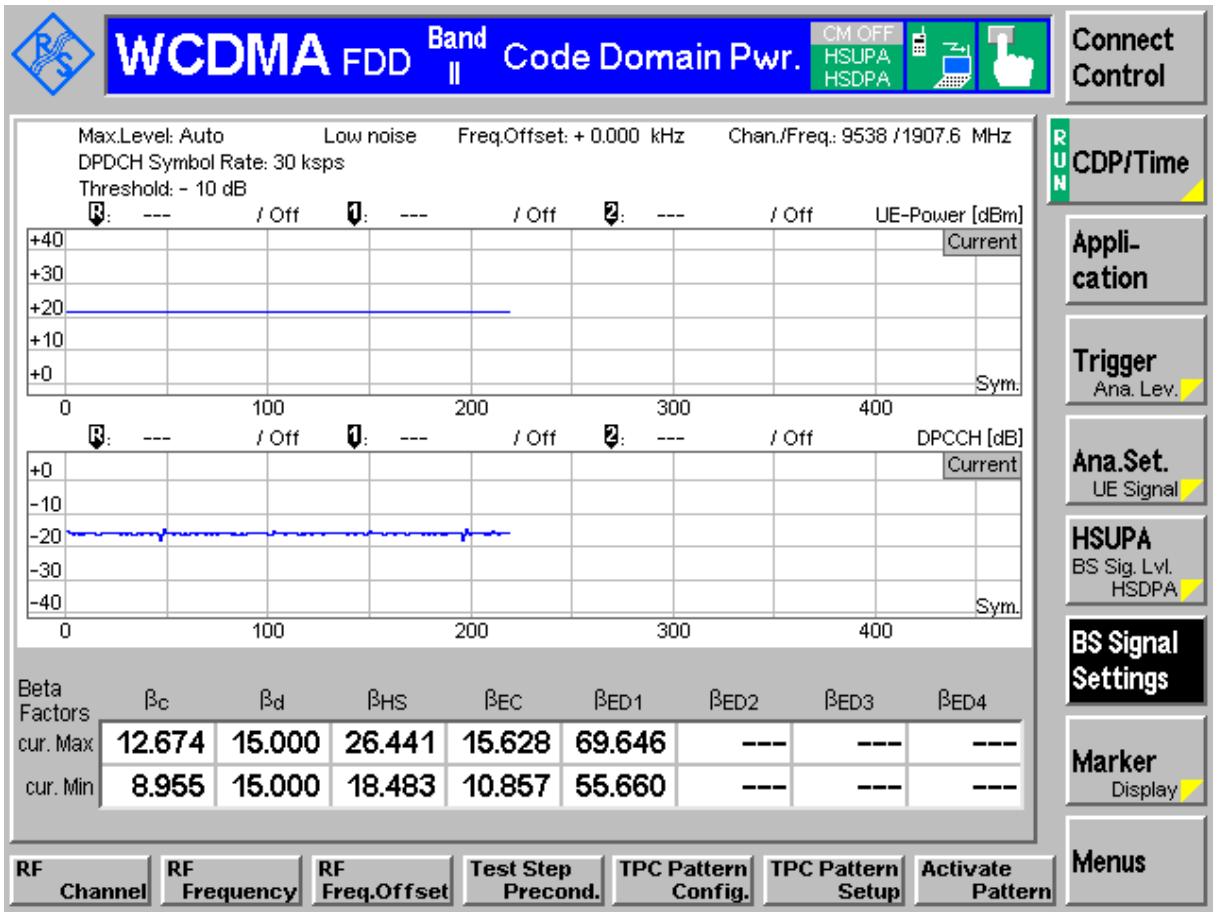
Sub-test	**β_c**	**β_d**	**β_{hs}**	**β_{ec}**	**β_{ed}**
5	15	15	30	24	134

By this way a surveillance of signalling conditions is possible to make sure that HSUPA code channels are active during the complete conducted power and SAR measurement.

Only with a stable β_{ed} value an MPR (maximum power reduction) of up to 2 dB is fully exhausted. Those conditions are shown in the following screen shots.

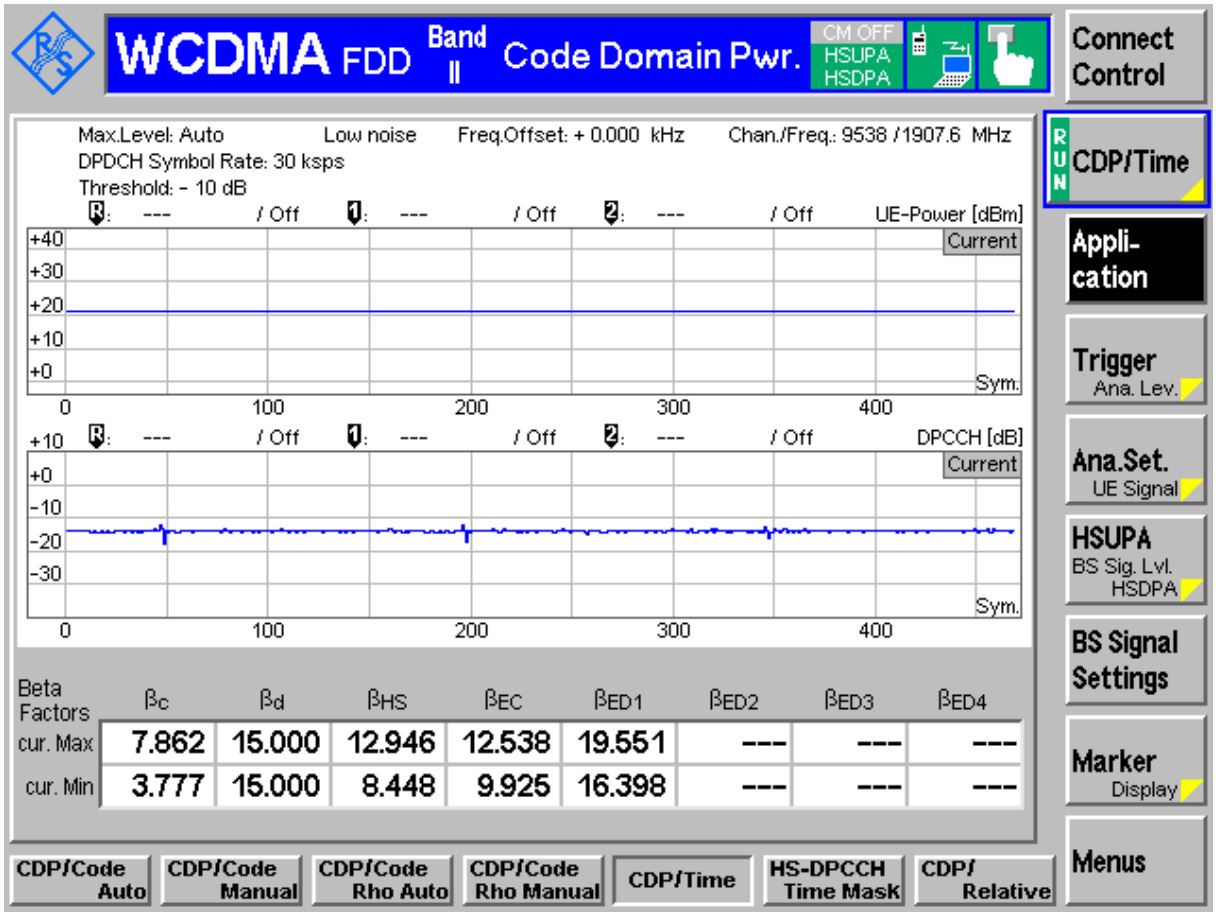
sub-test 1 :

numerator of target β_{ed} value : 1039/225 *15 = 69.26 ; measured max : 69.65



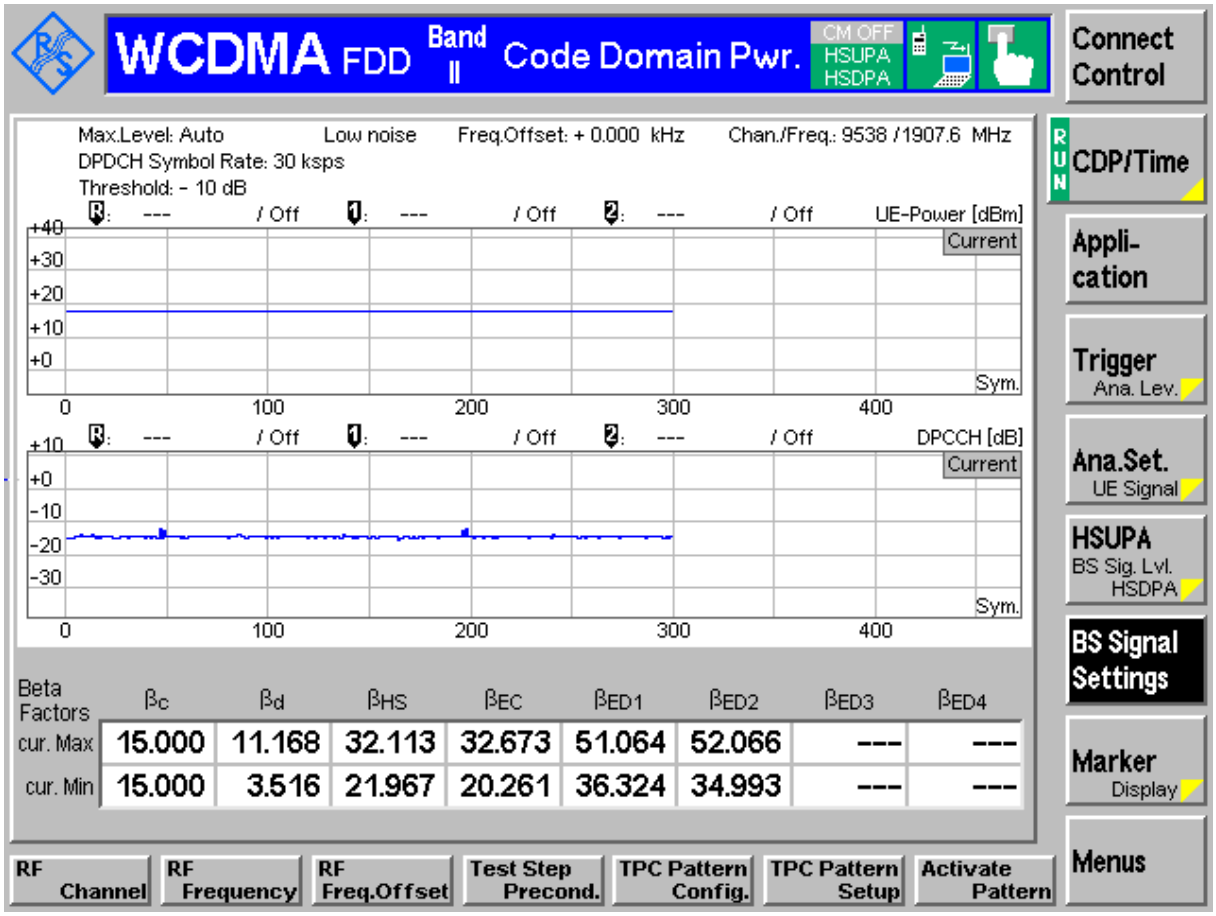
sub-test 2 :

numerator of target β_{ed} value : 56/75 *15 = 18.8 ; measured max : 19.55



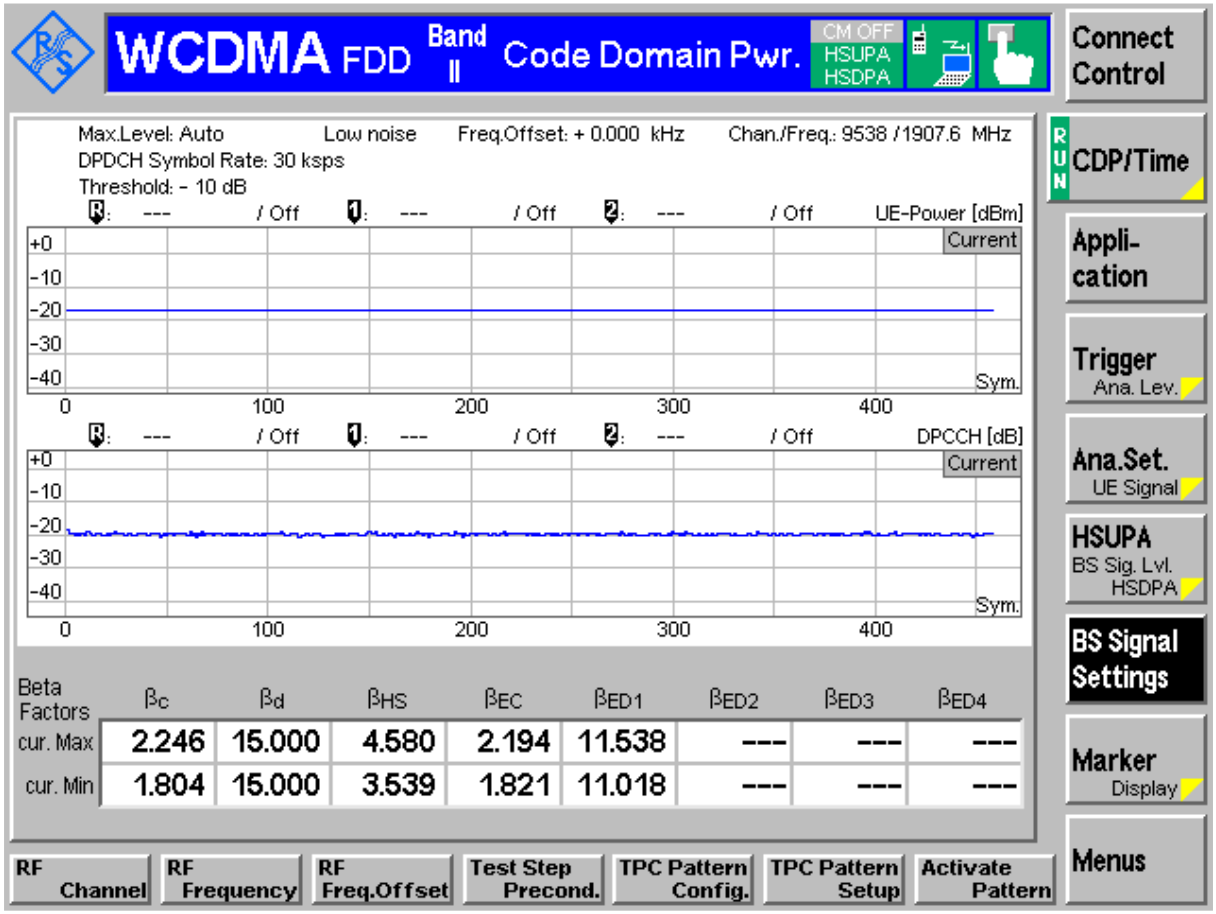
sub-test 3 :

numerator of target β_{ed} value : 47/15 *15 = 47 ; measured max : 51.06 and 52.07 (2 E-DPDCHs)



sub-test 4 :

numerator of target β_{ed} value : 56/75 *15 = 11.2 ; measured max : 11.54



sub-test 5 :

numerator of target β_{ed} value : 134/15 *15 = 134 ; measured max : 136.44