Appendix F. FCC 3G SAR Measurement Procedures

Conducted Output Power:

The PBA is fulfilled. The EUT was tested according to the requirements of the FCC 3G procedures and the TS 34.121. The EUT's WCDMA and HSPA function is Release 6 version supporting HSDPA Category 8, and HSUPA Category 6. A detailed analysis of the output power for all WCDMA and HSPA (HSUPA & HSDPA) modes is provided in the tables below. According to the FCC 3G procedures, handsets with both HSDPA and HSUPA should be tested according to Release 6 HSPA test procedures, and the EUT does not support VOIP function over the HSPA function. Device was tested according to procedure KDB941225 - section Release 6 HSPA Data Devices as documented/evaluated in the following table.

WCDMA Band II - Conducted Power								
Mode	**Setup**	**WCDMA Band II (1900)**			**Target MPR (dB)**	**MPR (dB)**		
		CH9262	**CH9400**	**CH9538**		**CH9262**	**CH9400**	**CH9538**
WCDMA	**RMC 12.2Kbps**	18.15	18.45	18.32	-	-	-	-
HSDPA	**HSDPA - subtest 1**	18.35	18.58	18.62	0	-0.11	-0.21	0.03
	HSDPA - subtest 2	18.24	18.37	18.65	0	0.00	0.00	0.00
	HSDPA - subtest 3	17.18	17.51	17.55	0.5	1.06	0.86	1.10
	HSDPA - subtest 4	17.22	17.44	17.63	0.5	1.02	0.93	1.02
HSUPA	**HSUPA - subtest 1**	18.05	18.21	18.29	0	0.19	0.16	0.36
	HSUPA - subtest 2	16.24	16.37	16.60	2	2.00	2.00	2.05
	HSUPA - subtest 3	16.55	16.66	16.96	1	1.69	1.71	1.69
	HSUPA - subtest 4	17.04	17.15	17.32	1	1.20	1.22	1.33
	HSUPA - subtest 5	18.03	18.18	18.40	0	0.21	0.19	0.25

WCDMA Band V - Conducted Power								
Mode	**Setup**	**WCDMA Band V (850)**			**Target MPR (dB)**	**MPR (dB)**		
		CH4132	**CH4182**	**CH4233**		**CH4132**	**CH4182**	**CH4233**
WCDMA	**RMC 12.2Kbps**	22.10	21.97	22.26	-	-	-	-
HSDPA	**HSDPA - subtest 1**	22.10	22.16	22.27	0	-0.20	-0.28	-0.17
	HSDPA - subtest 2	21.90	21.88	22.10	0	0.00	0.00	0.00
	HSDPA - subtest 3	21.06	20.82	21.36	0.5	0.84	1.06	0.74
	HSDPA - subtest 4	20.94	20.88	21.30	0.5	0.96	1.00	0.80
HSUPA	**HSUPA - subtest 1**	21.30	20.99	22.00	0	0.60	0.89	0.10
	HSUPA - subtest 2	20.18	19.83	20.21	2	1.72	2.05	1.89
	HSUPA - subtest 3	20.84	20.44	20.93	1	1.06	1.44	1.17
	HSUPA - subtest 4	20.53	20.27	21.00	1	1.37	1.61	1.10
	HSUPA - subtest 5	21.42	21.08	22.08	0	0.48	0.80	0.02

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Note:
For HSUPA, the following table lists the MPR target values:

HSPA MPR Targets		
HSUPA 3GPP Subtest	**Band V MPR Target (dB)**	**Band II MPR Target (dB)**
1	0	0
2	2	2
3	1	1
4	1	1
5	0	0

When evaluating HSPA power reduction, HSPA transmit power measurements should be referenced to HSDPA subtest 2 (CM=1, MPR=0) per Note 2 of TS 3GPP 34.121 Table C.11.1.3.

Based on the hardware characteristics and HSUPA measurement error inherent in the 34.121 procedure, Qualcomm expects HSUPA transmit power result to be within +/-1.0 dB of the expected MPR target values.

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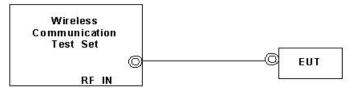Report Version   : Rev. 02

WCDMA Setup Configuration:

a. The EUT was connected to Base Station referred to the drawing of Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting
   i. Data rates: Varied from RMC 12.2Kbps
   ii. RMC Test Loop = Loop Mode 1
   iii. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Setup Configuration

HSDPA Setup Configuration:

a. The EUT was connected to Base Station referred to the drawing of Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors (β_c and β_d) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set DeltaACK, DeltaNACK and DeltaCQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1, Note 2)	CM (dD) (Note 3)	MPR (dD) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 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 = 11/15 and β_d = 15/15.

Setup Configuration

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HSPA (HSUPA & HSPDA) Setup Configuration:

a. The EUT was connected to Base Station referred to the drawing of Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode = Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 5)(Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	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_{ed}1: 47/15 β_{ed}2: 47/15	4 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 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with 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: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

Note: For details settings in the Agilent 8960 test equipment, please refer to the user guide " HSUPA Measurement Guide with 8960 V7.5.0 Release 7 (2007-06) Ver.: v.02.18"

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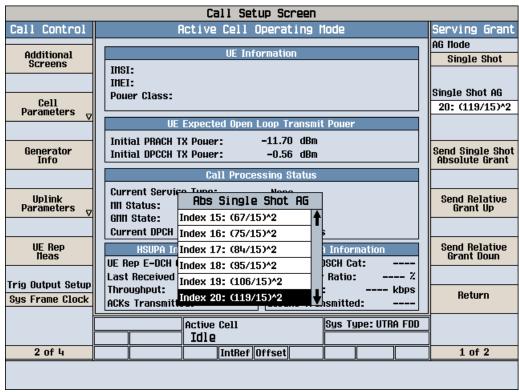
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```
                        Call Setup Screen
Call Control       Active Cell Operating Mode        Call Parms
                                                    Cell Power
 Channel                 UE Information                 -86.00
(UARFCN) Info   IMSI:                                dBm/3.84 MHz
                IMEI:                               Channel Type
                Power Class:                         12.2k + HSPA
 Cell
Parameters  ▽     UE Expected Open Loop Transmit Power
                Initial PRACH TX Power:    -11.70 dBm  Paging Service
 Generator      Initial DPCCH TX Power:     -0.56 dBm  RB Test Mode
  Info
                  Uplink Parameters          Value
 Uplink        PRACH Preambles               64    ↑     HSPA
Parameters  ▽  PRACH Ramping Cycles(MMAX)     2          Parameters
               Available Subchannels (Bit Mask) 000000000001
 UE Rep        Uplink DPCH Scrambling Code    0     34.121 Preset
 Meas          Uplink DPCH Bc/Bd Control     Manual  Call Configs ▽
               Manual Uplink DPCH Bc         11
 Close         Manual Uplink DPCH Bd         15      Channel
 Menu          Maximum Uplink Transmit Power Level 21 dBm (UARFCN) Parms
                              Active Cell    Sys Type: UTRA FDD
                                Idle
 2 of 4                     IntRef Offset              1 of 3
```

Example for HSPA Subtest 1, and other subtests following table, C11.1.3
(Gain Factors ($\beta_c = 11$ and $\beta_d = 15$))

```
                        Call Setup Screen
Call Control       Active Cell Operating Mode      Serving Grant
                                                    AG Mode
 Additional              UE Information             Single Shot
  Screens       IMSI:
                IMEI:
                Power Class:                       Single Shot AG
 Cell                                               20: (119/15)^2
Parameters  ▽     UE Expected Open Loop Transmit Power
                Initial PRACH TX Power:    -11.70 dBm
 Generator      Initial DPCCH TX Power:     -0.56 dBm Send Single Shot
  Info                                              Absolute Grant
                     Call Processing Status
                Current Service Type:     None
 Uplink         MM Status:     ┌─ Abs Single Shot AG ─┐ Send Relative
Parameters  ▽   GMM State:     │ Index 15: (67/15)^2  │↑  Grant Up
                Current DPCH   │ Index 16: (75/15)^2  │
                ┌ HSUPA In ────│ Index 17: (84/15)^2  │─ Information  Send Relative
 UE Rep         UE Rep E-DCH   │ Index 18: (95/15)^2  │ DSCH Cat: ----  Grant Down
 Meas           Last Received  │ Index 19: (106/15)^2 │ r Ratio: ---- %
Trig Output Setup Throughput:  │ Index 20: (119/15)^2 │↓ ---- kbps
Sys Frame Clock ACKs Transmitt └──────────────────────┘ nsmitted: ----  Return
                              Active Cell    Sys Type: UTRA FDD
                                Idle
 2 of 4                     IntRef Offset              1 of 2
```

Example: AG – Index = 20 for HSPA subtest 1

```
                        Call Setup Screen
 Screen Ctrl      Recorded E-TFCI Information          E-TFCI Record
                                                      E-TFCI Rec Count
   Channel                                                  15
 (UARFCN) Info           E-TFCI Recording State
                                 Idle
                                                       Start Recording
    HSPA                                                E-TFCI Values
 Information             Recorded E-TFCI Values
                   1:  75  11:  75  21: ----  31: ----  41: ----
                   2:  75  12:  75  22: ----  32: ----  42: ----
E-TFCI Recording   3:  75  13:  75  23: ----  33: ----  43: ----
  Information       4:  75  14:  75  24: ----  34: ----  44: ----
                   5:  75  15:  75  25: ----  35: ----  45: ----
                   6:  75  16: ----  26: ----  36: ----  46: ----
                   7:  75  17: ----  27: ----  37: ----  47: ----  Send Step Up
                   8:  75  18: ----  28: ----  38: ----  48: ----  TPC Bit Pattern
                   9:  75  19: ----  29: ----  39: ----  49: ----
    Clear         10:  75  20: ----  30: ----  40: ----  50: ----
   UE Info                                                         Send Step Down
                               15/15                               TPC Bit Pattern

   Return                                                  Return

              ⊟ Background  │Active Cell        │Sys Type: UTRA FDD
                             Connected
                            │IntRef│Offset│
```

Example: Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1

Reference:

[1]   941225 D01 SAR test for 3G devices v02, SAR Measurement Procedures for 3G Devices CDMA 2000/Ev-Do/WCDMA/HSDPA/HSPA Oct. 2007 Laboratory Division Office of Engineering and Technology Federal Communications Commission

[2.]   TS 34.121 Universal Mobile Telecommunications System (UMTS); Terminal Conformance Specification, Radio Transmission and Reception (FDD)

[3.]   HSUPA Measurement Guide with 8960 V7.5.0 Release 7 (2007-06) Ver.: v.02.18

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