POWER ANALYSIS TEST REPORT

Test of: C6603

To: OET Bulletin 65 Supplement C: (2001-01)
IEEE1528:2003

FCC ID: PY7PM-0270

Test Report Serial No:
UL-SAR-RP90579JD02B V1.0

Version 2.0 supersedes all previous report versions

This Test Report Is Issued Under The Authority Of Richelieu Quoi, SAR Technology Consultant:	 (APPROVED SIGNATORY)
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Issue Date:	**07 February 2013**
Test Dates:	**17 December 2012 to 14 January 2013**

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1. Customer Information

Company Name:	Sony Mobile Communications AB
Address:	Nya Vattentornet 22188 Lund Sweden

2. Test Specification, Methods and Procedures

2.1. Test Specification

Reference:	OET Bulletin 65 Supplement C: (2001-01)
Title:	Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
Purpose of Test:	To determine whether the equipment met the basic restrictions as defined in OET Bulletin 65 Supplement C: (2001-01) using the SAR averaging method as described in the test specification above.

The Equipment Under Test complied with the Specific Absorption Rate for general population/uncontrolled exposure limit of 1.6 W/kg as specified in FCC 47 CFR part 2 (2.1093) and ANSI C95.1-1992 and has been tested in accordance with the reference documents in section 3.2 of this report.

2.2. Methods and Procedures Reference Documentation

The methods and procedures used were as detailed in:

Federal Communications Commission, “Evaluating compliance with FCC Guidelines for human exposure to radio frequency electromagnetic fields”, OET Bulletin 65 Supplement C, FCC, Washington, D.C, 20554, 2001.

Thomas Schmid, Oliver Egger and Neils Kuster, “Automated E-field scanning system for dosimetric assessments”, IEEE Transaction on microwave theory and techniques,
Vol. 44, pp. 105-113, January 1996.

Neils Kuster, Ralph Kastle and Thomas Schmid, “Dosimetric evaluation of mobile communications equipment with know precision”, IEICE Transactions of communications, Vol. E80-B, No.5, pp. 645-652, May 1997.

IEEE 1528: 2003
IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

FCC KDB Publication:

KDB 447498 D01 General RF Exposure Guidance v05

KDB 648474 D04 SAR Handsets Multi Xmiter and Ant v01

KDB 941225 D01 SAR test for 3G devices v02

KDB 941225 D06 "Hot Spot SAR v01"

KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01

KDB 865664 D02 SAR Reporting v01

2.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

3. Equipment Under Test (EUT)

Description:	Mobile Handset
Brand Name:	Sony
Model Name or Number:	C6603
Type Number:	PM-0270-BV
Serial Number:	CB5A1M517Y
IMEI Number:	00440245-05627-1
Hardware Version Number:	AP1.2
Software Version Number:	10.1.A.0.270
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0270
Industry Canada ID Number:	4170B-PM0270
Country of Manufacture:	China
Date of Receipt:	16 December 2012

Note(s):

This sample was used to perform WWAN conducted power measurements only. The sample supports simultaneous transmission with the WWAN and WLAN. Wireless Personal Hotspot is also supported and was evaluated as per KDB 941225 D06 "Hot Spot SAR v01"

3.1. Description of EUT

The Equipment Under Test is a Smart Phone with GSM 2G Quad Band, 3G Tri band, LTE Hexa Band and Wi-Fi bands. The EUT has GPRS Class 33 / EDGE Class 33, UMTS FDD 1, 5, 8 With HSPA (with HSDPA Category 24 and HSUPA Category 6) , LTE Band 1, 3, 5, 7, 8, 20, WLAN 802.11 a/b/g/n, Bluetooth Class 1, Personal hotspot mode and RFID mode capabilities.

3.2. Modifications Incorporated in the EUT

EUT (IMEI: 00440245-05627-1) is used to perform WWAN conducted power measurements only

3.3. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Wireless Communication Test Set
Brand Name:	Agilent
Model Name or Number:	8960 Series 10 (E5515C)
Serial Number:	GB46311280
Cable Length and Type:	~4.0m Utiflex Cable
Connected to Port:	RF (Input / Output) Air Link

Description:	Wireless Communication Test Set
Brand Name:	Agilent
Model Name or Number:	8960 Series 10 (E5515E)
Serial Number:	GB46200666
Cable Length and Type:	~4.0m Utiflex Cable
Connected to Port:	RF (Input / Output) Air Link

3.4. Additional Information Related to Testing

Equipment Category	UMTS FDD 5			
Type of Unit	Portable Transceiver			
Intended Operating Environment:	Within GSM, UMTS, LTE , WiFi and *Bluetooth* Coverage			
	UMTS FDD 5	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.		
Transmitter Frequency Range:	UMTS FDD 5	826 to 847 MHz		
Transmitter Frequency Allocation of EUT When Under Test:	**Bands**	**Channel Number**	**Channel Description**	**Frequency (MHz)**
	UMTS FDD 5	4132	Low	826.4
		4183	Middle	836.6
		4233	High	846.6

Additional Information Related to Testing (Continued):	
Modulation(s):	UMTS (QPSK): 0 Hz
Modulation Scheme (Crest Factor):	(UMTS FDD / HSDPA): 1
Antenna Type:	Internal integral
Antenna Length:	Unknown
Number of Antenna Positions:	1 fixed (WWAN) 1 fixed (GPS/WLAN/*Bluetooth*) 1 fixed (NFC) 1 fixed (Diversity)
Power Supply Requirement:	3.7V
Battery Type(s):	Li-ion

4. Deviations from the Test Specification

Test was performed as per KDB 447498 D01 General RF Exposure Guidance v05, KDB 648474 D04 SAR Handsets Multi Xmiter and Ant v01, KDB 941225 D01 SAR test for 3G devices v02, KDB 941225 D06 "Hot Spot SAR v01" , KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01, KDB 865664 D02 SAR Reporting v01 , according to the handset procedures in IEEE Std 1528-2003 and OET Bulletin 65 Supplement C 01-01. The assessment for Personal Wireless Hotspot was also evaluated as per the FCC KDB 941225 D06 "Hot Spot SAR v01".

5. Operation and Configuration of the EUT during Testing

5.1. Operating Modes

The EUT was tested in the following operating mode(s) unless otherwise stated:

- UMTS FDD 5 Call allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum as per KDB 941225 D01.
- UMTS FDD 5 - DC HSDPA (Cat 24) With Test loop mode 1 and TPC bits configured to all "1's", Sub-test 1 with Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01. (See Appendix 3 for detailed description)

5.2. Configuration and Peripherals

The EUT was tested in the following configuration(s) unless otherwise stated:

- Standalone fully charged battery powered and dummy battery
- Agilent 8960 model E5515E base station simulator supports DC-HSDPA, was used to perform DC-HSDPA power measurements. Please refer to Appendix 3 for test set setup to achieve TS 34.121 parameters. The setting covers FRC H-Set 12 (QPSK) in Table C.8.1.12 of TS 34.121-1 to measure DCHSDPA uplink maximum output power using the 4 Rel. 5 HSDPA subtests in Table C.10.1.4 of TS 234.121-1.
- KDB 941225 Rel 6. HSPA procedures were applied to determine SAR exclusion for DC-HSDPA according to the measured power. As the measure maximum output power for DC-HSDPA is ≤ ¼ dB higher than the WCDMA 12.2 kbps RMC maximum output, SAR was not required.
- The module power levels were measured in both HSPA and 3G RMC 12.2kbps modes and compared to ensure the correct mode of operation had been established.

5.3. Location of Tests

All the measurements described in this report were performed at the premises of
UL, Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG United Kingdom

6. Measurements, Examinations and Derived Results

6.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to section 8 for details of measurement uncertainties.

6.2. Conducted Power Measurements
6.2.1.Conducted Average Power Measurement 3G:

Modes		DC HSDPA (Cat 24)				WCDMA
Sets		1	2	3	4	Voice / RMC 12.2kbps
Band	Channel	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]
850 (Band 5)	4132 4357	22.3	22.5	22.2	22.4	23.7
	4183 4408	22.4	22.5	22.1	22.3	23.8
	4233 4458	22.4	22.4	22.0	22.1	23.7
ßc		2	12	15	15	
ßd		15	15	8	4	
ΔACK, ΔNACK, ΔCQI		8	8	8	8	
AGV		-	-	-	-	

*Agilent 8960 model E5515E base station simulator supports DC-HSDPA, was used to perform DC-HSDPA power measurements. Please refer to Appendix 3 for test set setup to achieve TS 34.121 parameters. The setting covers FRC H-Set 12 (QPSK) in Table C.8.1.12 of TS 34.121-1 to measure DCHSDPA uplink maximum output power using the 4 Rel. 5 HSDPA subtests in Table C.10.1.4 of TS 234.121-1.

KDB 941225 Rel 6. HSPA procedures were applied to determine SAR exclusion for DC-HSDPA according to the measured power. As the measure maximum output power for DC-HSDPA is ≤ ¼ dB higher than the WCDMA 12.2 kbps RMC maximum output, SAR was not required.

7. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Conducted Output Power	826 to 847 MHz	95%	±0.20 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

Appendix 1. Test Equipment Used

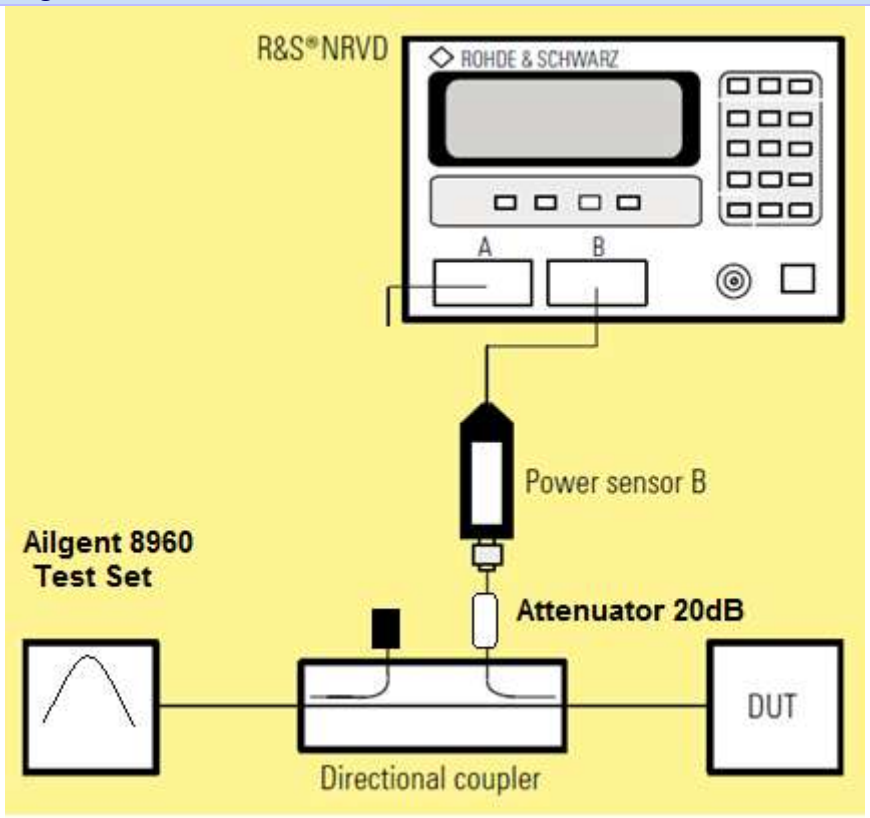
RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A034	Narda 20W Termination	Narda	374BNM	8706	Calibrated as part of system	-
A1097	SMA Directional Coupler	MiDISCO	MDC6223-30	None	Calibrated as part of system	-
A1497	Amplifier	Mini-Circuits	zhl-42w (sma)	e020105	Calibrated as part of system	-
C1146	Cable	Rosenberger MICRO-COAX	FA147A F030003030	41752-1	Calibrated as part of system	-
G087	PSU	Thurlby Thandar	CPX200	100701	Calibrated before use	-
M1159	Signal Generator	Agilent Technologies	E8241A	US42110332	Internal Checked 10 Dec 2012	4
M1647	Signal Generator	Hewlett Packward	8648C	3537A01598	01 Jun 2012	12
M1023	Dual Channel Power Meter	R & S	NRVD	863715/030	18 July 2012	12
M1269	Multimeter	Fluke	179	90250210	15 Jul 2011	12
S256	SAR Lab	UL	Site 56	N/A	Calibrated before use	-
S512	SAR Lab	UL	Site 57	N/A	Calibrated before use	-

Note:

All the assets were in calibration during the course of testing.

Appendix 2. Measurement Methods

Test Setup Diagram:



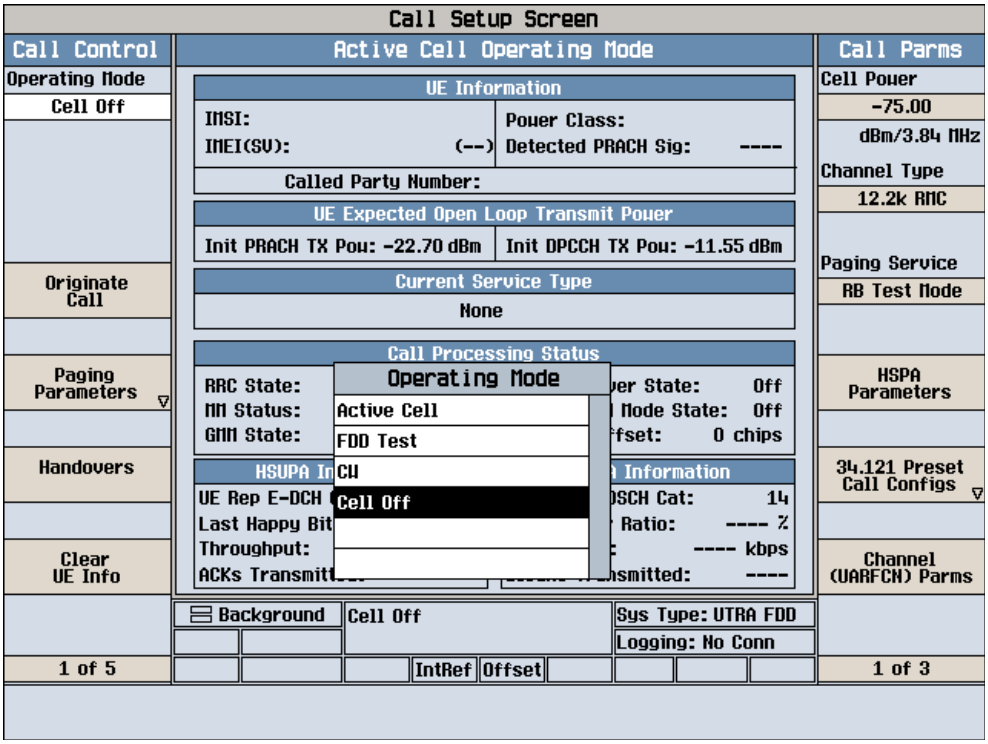
Appendix 3. CAT24 Test set-up

A.3.1. Establish a DC-HSDPA RB Test Mode Connection with DL 42Mbps

RB (radio bearer) test mode is a special, defined-channel configuration designed to simplify the testing environment. Since W-CDMA is an incredibly flexible system, defined radio bearers, called RMCs (reference measurement channels) simplify which configurations need to be tested for RF performance.
RB test mode provides the ability to set up a standalone channel configuration originating from the 8960 via call-processing. The direction of the call setup is always from the 8960 to the UE. This is the typical RF test that is used throughout the lifecycle of a device"s design process. Using RB test mode is attractive to device manufacturers because it does not require extra software to control the UE. In this type of call connection, the radio bearer (within the 8960) essentially controls the UE during test.

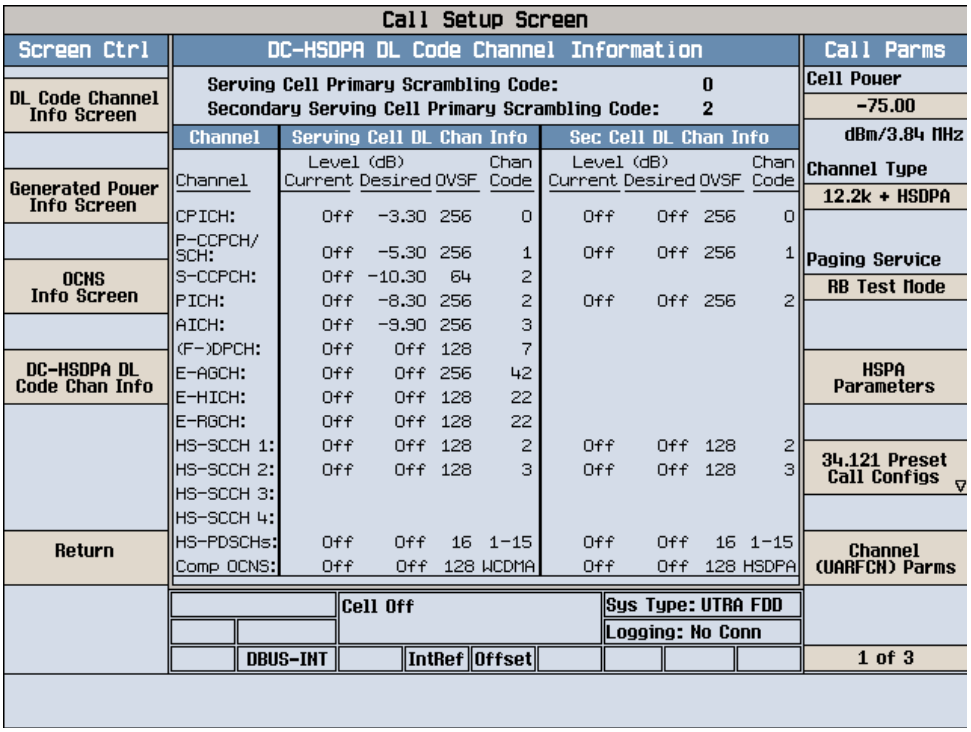
A.3.1.1 Configure 8960

1. Press **Operating Mode** (**F1**), select **Cell Off** operating mode.



2. **Set the Channel type** to **12.2k + HSDPA**.

3. Set the downlink channel code. In order to achieve the 42 Mbps maximum downlink throughput, you have to set up 15 HS-PDSCHs which will possibly cause a code collision.
To easily configure the downlink 15 HS-PDSCH for a maximum throughput, use the code preset to configure the code channels for both the serving cell and the secondary serving cell.
Select **Call Control 2 of 6**-> **Generator Info (F3)** -> **Downlink Channel Configs (F4)** -> **DL Chan code Preset Configs (F5)**, choose **34.121 Tables E.6.2.3,4 (HSDPA 15 HS-PDSCHs).**
Set the **Conn S-CCPCH Cfg** to **Off** to avoid the code collision.
To see the channel code allocation for the serving cell and the secondary serving cell, select **Additional Gen Info Screens (F1) -> DC-HSDPA DL Code Chan Info (F4).**



4. Configure DC-HSDPA parameters to achieve the Maximum Downlink Data Rate:
First of all, you must know the maximum data rate of the device under test according to its category and the key factors to achieve the maximum date rate. In this lab, you use a category 24 device whose maximum data rate is 42 Mbps when DC-HSDPA is configured.
a) Set up the HSDPA RB Test Mode Parameters

*Path: Call Parms 1 of 3 -> HSPA Parameters (**F10**) -> HSDPA Parameters (**F10**) -> HSDPA RB Test Mode Setup (**F8**) -> HSDPA RB Test Mode Settings (**F8**).*

- **RB Test HS-DSCH Configuration Type** = **User Defined**
- **RB Test User Defined HS-DSCH MAC entity** = **MAC-ehs** (Note 1)
- **RB Test User Defined HARQ Processes** = **6** (Note 2)
- **RB Test User Defined UE IR Buffer Allocation** = **Implicit**
- **RB Test User Defined DC-HSDPA State** = **On**
- **RB Test Mode DC-HSDPA DPCH Loopback State** = **On**

Note 1: DC-HSDPA requires MAC-ehs. You must set the MAC entity to MAC-ehs before setting the DC-HSDPA state)
Note 2: To restrict the amount of soft memory that can be allocated to a single HARQ process (and thus limit the amount of data that has to be transferred across the UE"s internal data buses) the specifications require that when setting up a DC-HSDPA call with the implicit HARQ memory partitioning the network must configure 6, 7, or 8 HARQ processes per cell. For the explicit HARQ memory partitioning case, the number of HARQ processes can be 1 through 8, but the memory size for each HARQ process cannot be greater than the number of soft channel bits for an implicit memory partitioning with 6 processes per HS-DSCH channel.
b) Set up the Serving Cell Parameters

Path: **F10**

- **RB Test User Defined 64QAM State** =**On**
- **RB Test User Defined Active HS-PDSCHs** =**15**
- **RB Test User Def Transport Block Size Index** =**62**
- **RB Test User Defined Modulation Type** =**64QAM**
- **RB Test User Defined Inter-TTI Interval** =**1**

c) Set up the Secondary Serving Cell Parameters
Path: **F11**

- **RB Test User Def Secondary Cell 64QAM State** =**On**
- **RBTM User Def Sec Cell Active HS-PDSCHs** = **15**
- **RBTM User Def Sec Cell TB Size Index** = **62**
- **RBTM User Def Sec Cell Modulation Type** =**64QAM**
- **RBTM User Def Sec Cell Inter-TTI Interval** = **1**

d) Set the **Secondary Serving Cell Power (dBm/3.84 MHz)** to **-25 dBm/3.84 MHz**

*Path: Return (**F12**) -> HSDPA Parms 2 of 2 -> Secondary Serv Cell Parms (**F10**)*
e) Set the **Cell power** to **-25 dBm/3.84 MHz**

*Path: CALL SETUP -> **F7***
f) Set the HSDPA Conn DL Channel Levels

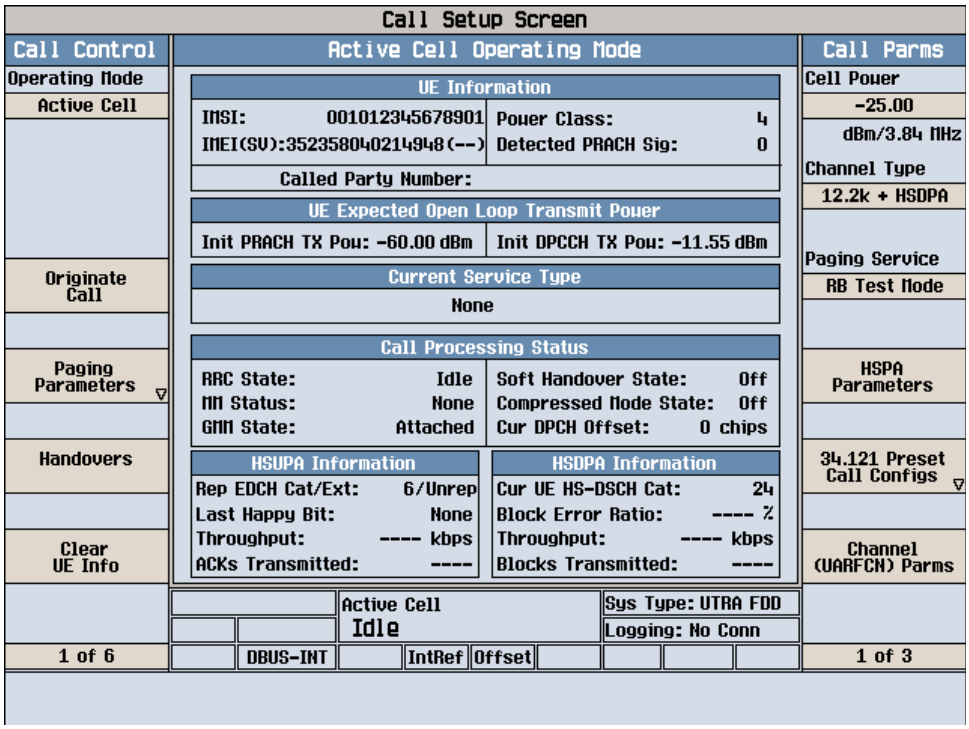
*Path: CALL SETUP -> Call Control 2 of 6 -> Generator Info (**F3**) ->Downlink Channel Levels (**F3**) -> Connected DL Channel Levels (**F3**) -> **F3***

- **HSDPA Cell 1 Connected CPICH Level** = **-8**
- **HSDPA Cell 1 Connected P-CCPCH/SCH Level** = **-20**
- **HSDPA Cell 1 Connected PICH Level** = **off**
- **HSDPA Cell 1 Connected DPCH Level** = **-30**
- **HSDPA Cell 1 Connected HS-PDSCH Level (Sum)** = **-1 dBm**
- **HSDPA Cell 1 Connected HS-SCCH 1 to 4 Level** = **-20,-20,off,off**
- **Secondary Cell HSDPA Conn CPICH Level** = **-8**
- **Secondary Cell HSDPA Conn PCCPCH/SCH Level** = **-20**
- **Secondary Cell HSDPA Conn PICH Level** = **off**
- **Secondary Cell HSDPA Conn HS-PDSCHs Lvl (Sum)** = **-1 dBm**
- **Secondary Cell HSDPA Conn HS-SCCH 1 to 4 Level** = **-20,-20,off,off**

5. Set the **Operating Mode** (**F1**) to **Active Cell**.

A.3.1.2. Power on the UE and Set up the Connection

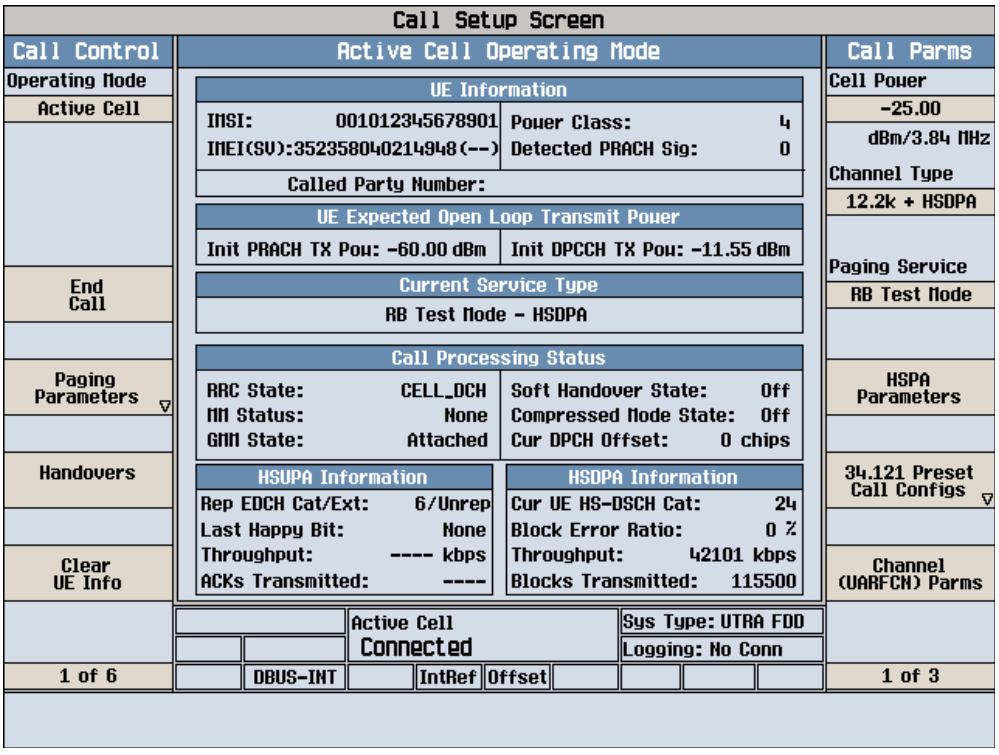
Power on the device, and then wait for it to camp on 8960. You should be able to see the following screen.



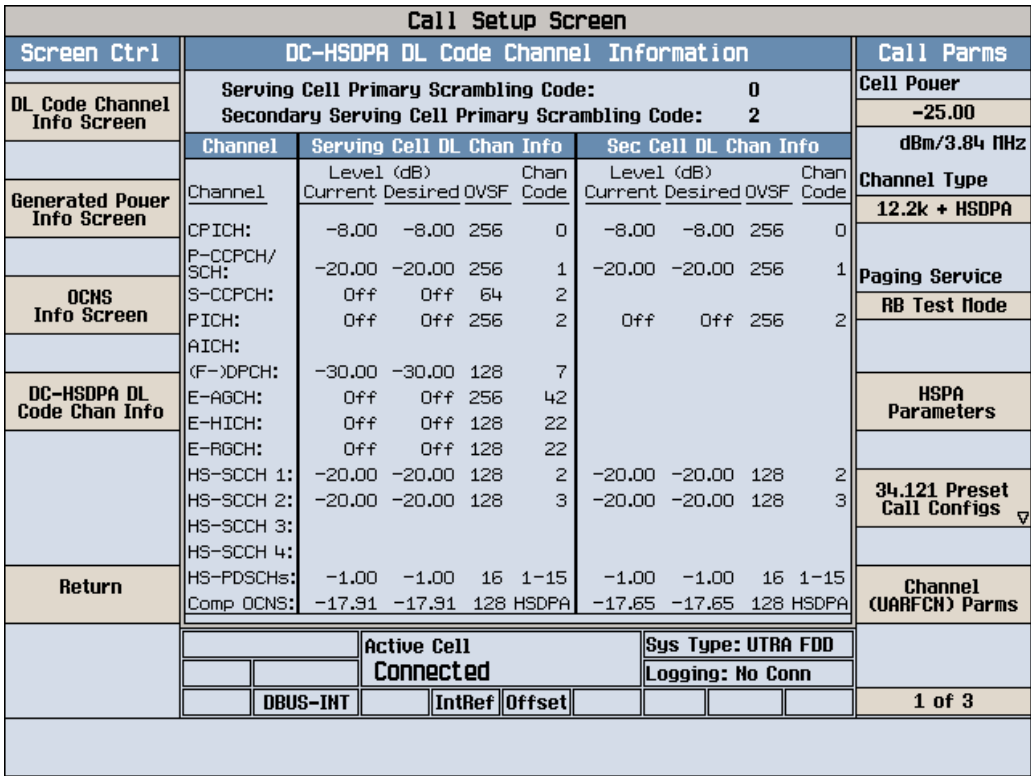
The UE reports HSDPA categories to 8960, which represents its maximum data rate capability. DC-HSDPA requires UE categories 21 to 24.
The GMM state must be **Attached**, otherwise you cannot establish a HSDPA connection.
2. Originate the Connection

a) Now, Originate an RB Test call with DC-HSDPA by pressing „**F3**" from the main Call Setup screen.

b) After a connection is set up, you will be able to see the throughput from the HSDPA Information window. Press the **Measurement Reset** key to reset the calculation.



Now you can also check the connected DC-HSDPA downlink channel levels.
*Path: CALL SETUP->Call Control 2 of 6 -> Generator Info (**F3**) -> Additional Gen Info Screens (**F1**) ->DC-HSDPA DL Code Chan Info (**F4**).*



A.3.2. Activate/ Deactivate the Secondary Serving Cell

Once a DC-HSDPA connection is established, 8960 can control the UE to start or stop monitoring the secondary serving cell using HS-SCCH orders. The HS-SCCH orders can be sent on either the serving or secondary serving cell.

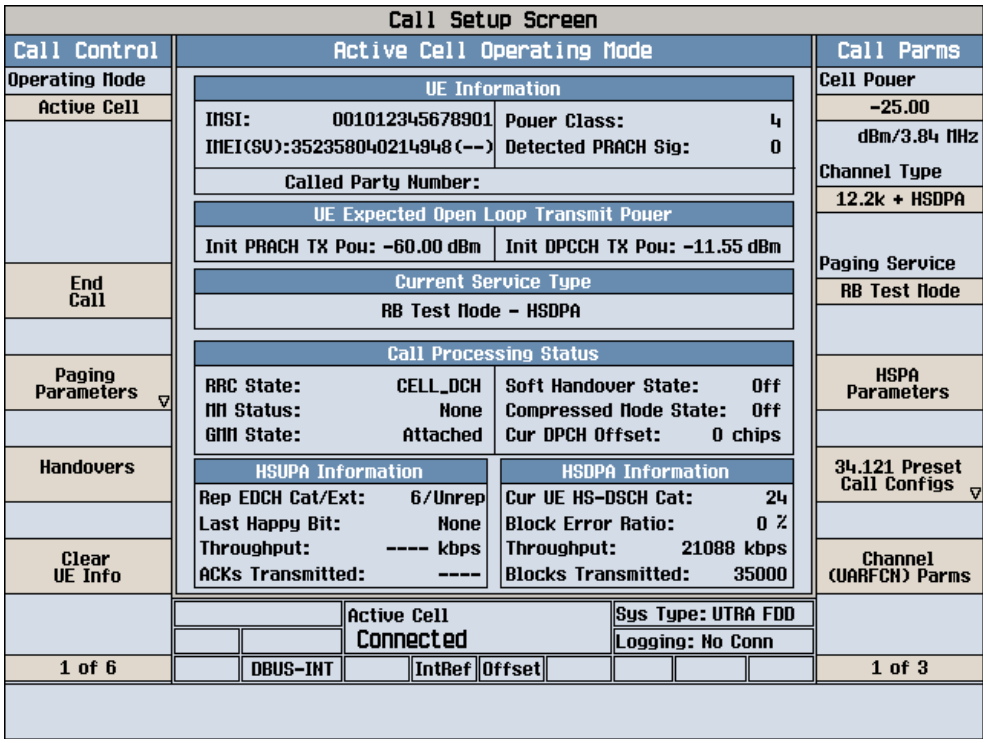
A.3.2.1 Deactivate the Secondary Serving Cell

1. Setup the Deactivate Secondary Cell Parameter

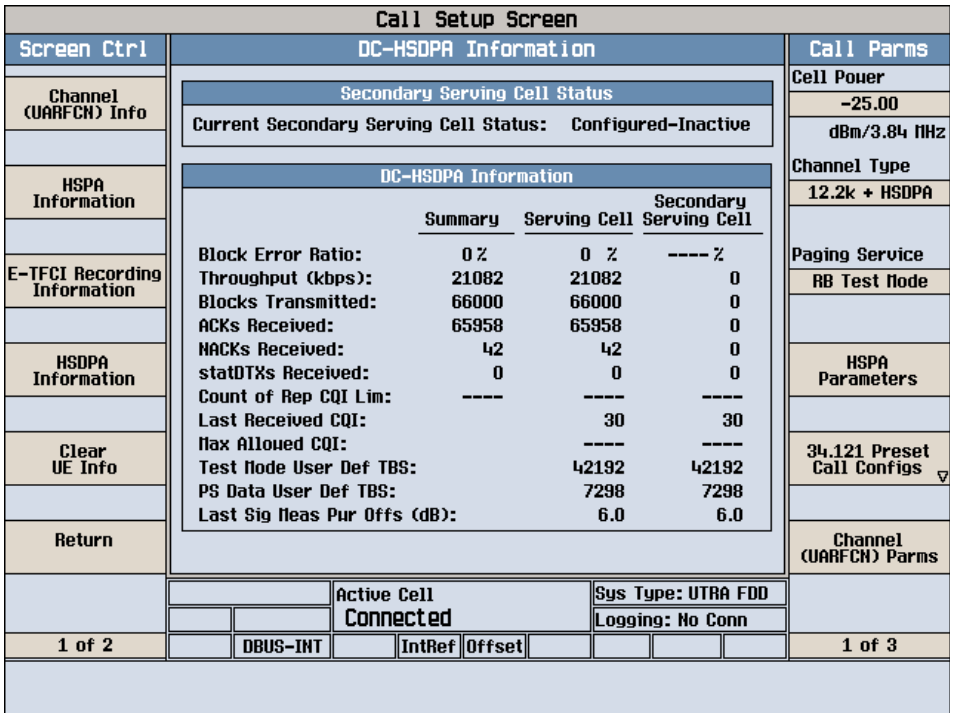
*Path: CALL SETUP->Call Control 6 of 6 -> HS-SCCH Order (**F3**) -> Deactivate Secondary Cell (**F2**)*
In this lab you set it to deactivate the secondary serving cell from the serving cell.

- **Deactivate Secondary Cell HS-SCCH Order From** = **Serving Cell**

Press **Send Deactivate Secondary Cell** (**F5**)
Press Measurement Reset key and see the throughput has dropped to 21 Mbps or so, like the figure below:

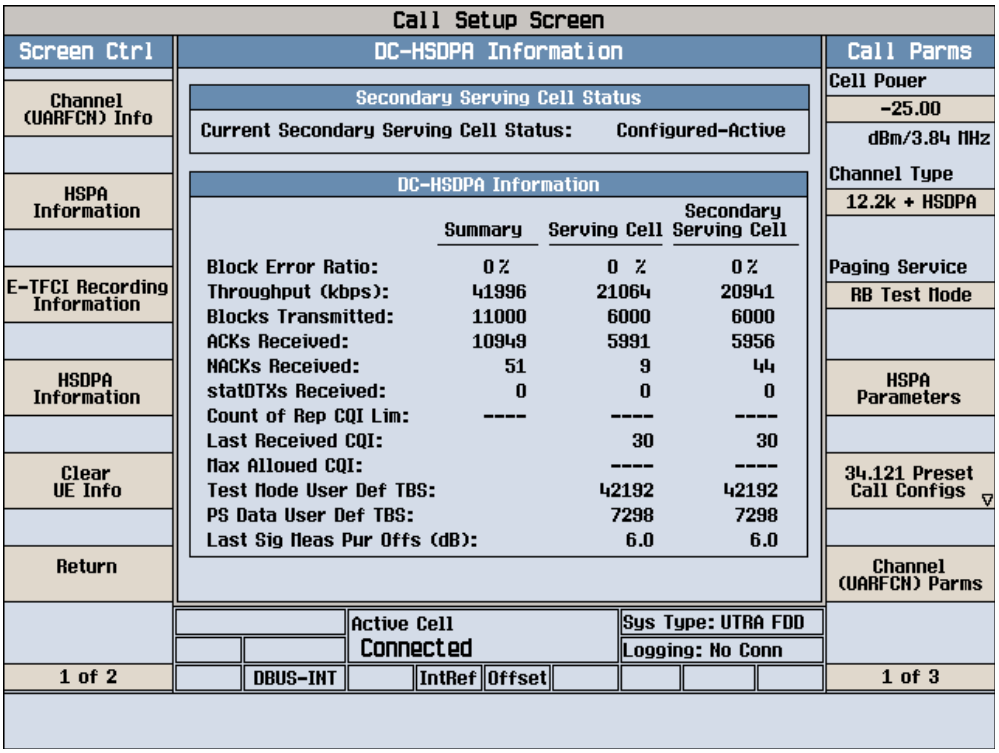


You can see more on the DC-HSDPA Information screen.
Path: *CALL SETUP->Call Control 2 of 6 -> Additional Screens (**F1**) -> HSDPA Information (**F4**) -> DC-HSDPA Information (**F4**).*



A.3.2.2 Re-activate the Secondary Serving Cell

Now you can activate the secondary serving cell by pressing back to the HS-SCCH Order menu.
*Path: CALL SETUP->Call Control 6 of 6 -> HS-SCCH Order (**F3**)*
Press **Send Activate Secondary Cell** (**F1**).
Press the Measurement Reset key and see the throughput has increased to 42 Mbps. When you look at the DC-HSDPA Information screen, you can see the secondary serving cell is set up again.



When DC-HSDPA is active, the HBLER measurement can also be used to perform receiver testing. 3GPP TS 34.121-1 sections 6.3C and 6.3D are supported and can be set up and tested as described in an appendix in another document, DC-HSDPA User Guide.