Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	48.9 Ω - 7.7 jΩ
Return Loss	- 22.1 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	47.2 Ω - 5.4 jΩ
Return Loss	- 24.1 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	49.9 Ω - 4.4 jΩ
Return Loss	- 27.2 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	53.4 Ω - 2.4 jΩ
Return Loss	- 27.9 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	50.9 Ω - 3.8 jΩ
Return Loss	- 28.3 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	48.5 Ω - 5.8 jΩ
Return Loss	- 24.3 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	47.5 Ω - 3.3 jΩ
Return Loss	- 27.4 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.9 Ω - 2.0 jΩ
Return Loss	- 33.0 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	53.9 Ω + 0.1 jΩ
Return Loss	- 28.6 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	52.6 Ω - 1.9 jΩ
Return Loss	- 30.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 27, 2006

DASY5 Validation Report for Head TSL

Date: 20.07.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1060

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.49 S/m; ε_r = 34.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.59 S/m; ε_r = 34.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.78 S/m; ε_r = 34.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.89 S/m; ε_r = 33.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.09 S/m; ε_r = 33.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2014, ConvF(5.21, 5.21, 5.21); Calibrated: 30.12.2014, ConvF(5.12, 5.12, 5.12); Calibrated: 30.12.2014, ConvF(4.92, 4.92, 4.92); Calibrated: 30.12.2014, ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

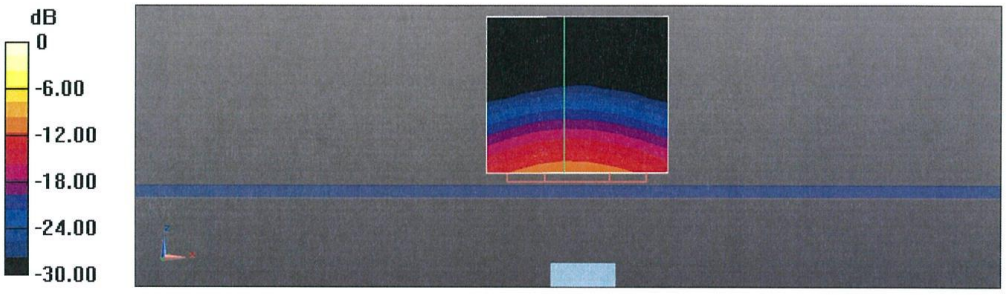
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.63 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 28.1 W/kg
SAR(1 g) = 7.86 W/kg; SAR(10 g) = 2.26 W/kg
Maximum value of SAR (measured) = 18.1 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.03 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 30.6 W/kg
SAR(1 g) = 8.25 W/kg; SAR(10 g) = 2.37 W/kg
Maximum value of SAR (measured) = 19.2 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.57 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 8.26 W/kg; SAR(10 g) = 2.36 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

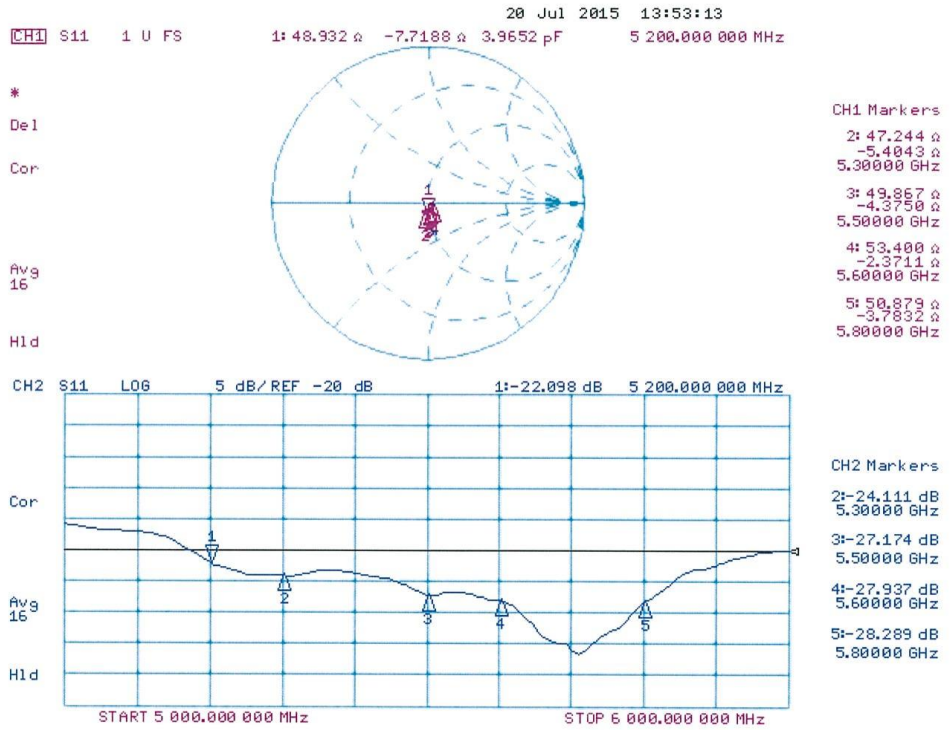
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.98 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 32.5 W/kg
SAR(1 g) = 8.35 W/kg; SAR(10 g) = 2.38 W/kg
Maximum value of SAR (measured) = 19.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.55 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 32.3 W/kg
SAR(1 g) = 7.99 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 19.3 W/kg = 12.86 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 27.07.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1060

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.47 S/m; ε_r = 47.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.6 S/m; ε_r = 46.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.86 S/m; ε_r = 46.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 6 S/m; ε_r = 46.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.28 S/m; ε_r = 46; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.95, 4.95, 4.95); Calibrated: 30.12.2014, ConvF(4.78, 4.78, 4.78); Calibrated: 30.12.2014, ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2014, ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2014, ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

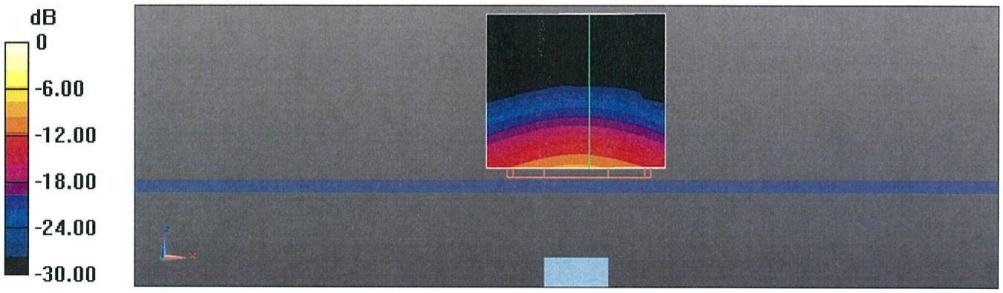
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.61 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 29.6 W/kg
SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.14 W/kg
Maximum value of SAR (measured) = 17.6 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.80 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 30.8 W/kg
SAR(1 g) = 7.74 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 18.2 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.05 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 34.9 W/kg
SAR(1 g) = 8.25 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 19.5 W/kg

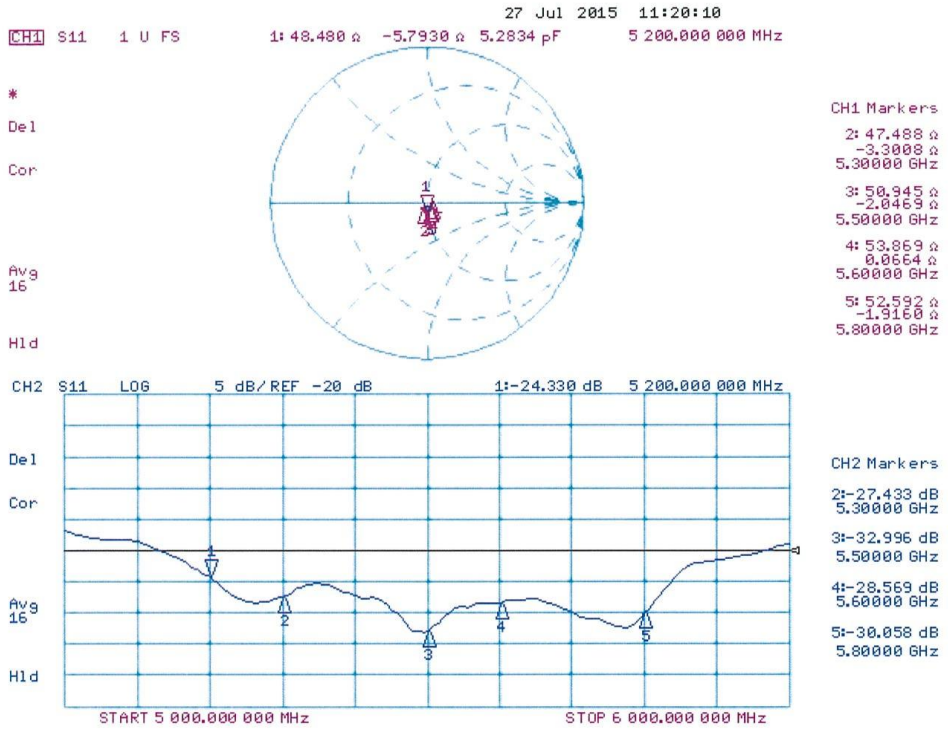
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.98 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 35.9 W/kg
SAR(1 g) = 8.28 W/kg; SAR(10 g) = 2.3 W/kg
Maximum value of SAR (measured) = 20.0 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 57.14 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 35.6 W/kg
SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 19.3 W/kg = 12.86 dBW/kg

Impedance Measurement Plot for Body TSL



ANNEX I Accreditation Certificate

China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(No. CNAS L0570)

Telecommunication Technology Labs,

Academy of Telecommunication Research, MIIT

No.52, Huayuan North Road, Haidian District, Beijing, China

No.51, Xueyuan Road, Haidian District, Beijing, China

to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing and calibration.

The scope of accreditation is detailed in the attached schedule bearing the same accreditation number as above. The schedule forms an integral part of this certificate.

Date of Issue: 2014-10-29

Date of Expiry: 2017-06-19

Date of Initial Accreditation: 1998-07-03

Signed on behalf of China National Accreditation Service for Conformity Assessment

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is the signatory to International Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (ILAC MRA) and Asia Pacific Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (APLAC MRA).

No.CNAS AL2

0011149

ANNEX J Dynamic antenna switching Test Configurations

The device supports the dynamic antenna switching function to optimize transmission efficiency for wide range frequency operations. It has two 2G/3G/4G Tx antennas (Main Antenna and Second Antenna). It can transmit from either Main Antenna or Second Antenna. The Main Antenna and Second Antenna can also transmit simultaneously only when two SIM cards work at the same time by using different modems. Main modem can support 2G/3G/4G. Second modem only supports 2G and can only be used for SIM2.

SAR test procedure for dynamic antenna switching is as below:

The Main Antenna and Second Antenna are set to the MAX transmit power level respectively and test the SAR respectively in all applicable RF exposure conditions. Some AT commands are supplied to fix the operation state and choose the antenna, and some test scripts are supplied to fix the modem state so that only one TX antenna and one modem is chosen and tested at a time. All independent antennas and modems are completely covered by the appropriate SAR measurements and all simultaneous transmission possibilities are fully considered. (Refer to Section 13 for details).

ANNEX K Dynamic antenna tuning Test Configurations

The device supports the dynamic antenna tuning function to optimize transmission efficiency for 1710MHz~2700MHz frequency operations.

The dynamic antenna tuning function is only applicable for some frequency bands of the 2G/3G/4G main Tx antenna (Main Antenna: GSM 1900(Main Modem), WCDMA B2/4, FDD LTE B2/4/7, TDD LTE B38/41), which is located in the bottom part of the device. The 2G/3G/4G main antenna has two fixed states for these tuning bands: the state 1 and state 2. The two states share the same antenna, RF path, test channel and conductive power. The software will choose better RSSI as the working state of the main TX antenna based on the RSSI comparison and switch algorithm. The PAG requirements for can be excluded per KDB 388624D02 and FCC guidance.

SAR test procedure for dynamic antenna tuning is as below:

a) Firstly, some AT commands are used to fix the tuning state at state1 or state 2, so that only one antenna tuning state is chosen at a time for SAR test.

b) Secondly, in order to reduce the number of SAR tests required to demonstrate compliance for the two tuning states, one single point zoom scan SAR measurement between state1 and state 2 for each antenna tuning band and applicable RF exposure condition is considered to identify the higher SAR tuning state that need the full set of normally required SAR measurements and allow SAR test reduction for the other lower SAR conditions.

c) Thirdly, full normally required SAR measurements are performed for the chosen higher SAR tuning state. The SAR worst case will also be checked for the other state in each antenna tuning band and applicable RF exposure condition to ensure the SAR compliance.

The PAG requirements for can be excluded per KDB 388624D02 and FCC guidance.

ANNEX L Power reduction specification

This device uses a single fixed level of power reduction through static table look-up for SAR compliance and it is triggered by a single event or operation per the PAG exclusion clause in KDB388624D02 item II.C.1.k:

1) A fixed level power reduction is applied for some frequency bands when hotspot mode becomes active. When the hotspot is disabled, the power value will be recovered.

2) A fixed level power reduction is applied for some frequency bands when simultaneously transmitting with the other antennas in certain simultaneous transmission conditions. The standalone SAR compliance still uses the standalone SAR results tested at the maximum output power level without any power reduction. The PAG requirements can be excluded per KDB 388624D02.

ANNEX M LTE CA specification

The device supports downlink Release 10 LTE Carrier Aggregation (CA) only. It supports a maximum of 2 carriers in the downlink. Other Release 10 features are not supported, including Uplink Carrier Aggregation, Enhanced SC-FDMA and Uplink MIMO or other antenna diversity configurations etc. All uplink communications are identical to the Release 8 Specifications.
According to KDB 941225 D05A, the downlink LTE CA SAR test is not required and PAG requirements can be excluded.

intra-band contiguous CA (per 3GPP TS 36.101 V12.8.0 Table 5.6A.1-1)

E-UTRA CA configuration / Bandwidth combination set					
E-UTRA CA configuration	**Uplink CA configurations (NOTE 3)**	**Component carriers in order of increasing carrier frequency**		**Maximum aggregated bandwidth [MHz]**	**Bandwidth combination set**
		Channel bandwidths for carrier [MHz]	**Channel bandwidths for carrier [MHz]**		
CA_7C	CA_7C	15	15	40	0
		20	20		
		10	20	40	1
		15	15, 20		
		20	10, 15, 20		
		15	10, 15	40	2
		20	15, 20		
CA_38C	CA_38C	15	15	40	0
		20	20		
CA_41C	CA_41C	10	20	40	0
		15	15		
		20	10, 20		
		10, 15	20	40	1
		15	15		
		20	10, 15, 20		

Table: Test frequencies for CA_7C

Range	CC-Combo / N_{RB_agg} [RB]	CC1 Note1					CC2 Note1				
		BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]	BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]
Low	75+75	75	20825	2507.5	2825	2627.5	75	20975	2522.5	2975	2642.5
	100+100	100	20850	2510	2850	2630	100	21048	2529.8	3048	2649.8
Mid	75+75	75	21025	2527.5	3025	2647.5	75	21175	2542.5	3175	2662.5
	100+100	100	21000	2525	3000	2645	100	21198	2544.8	3198	2664.8
High	75+75	75	21225	2547.5	3225	2667.5	75	21375	2562.5	3375	2682.5
	100+100	100	21152	2540.2	3152	2660.2	100	21350	2560	3350	2680
Note 1: Carriers in increasing frequency order.											

Table: Test frequencies for CA_38C

Range	CC-Combo / N_{RB_agg} [RB]	CC1 Note1			CC2 Note1		
		BW [RB]	$N_{UL/DL}$	$f_{UL/DL}$ [MHz]	BW [RB]	$N_{UL/DL}$	$f_{UL/DL}$ [MHz]
Low	75+75	75	37825	2577.5	75	37975	2592.5
	100+100	100	37850	2580	100	38048	2599.8
Mid	75+75	75	37925	2587.5	75	38075	2602.5
	100+100	100	37900	2585	100	38098	2604.8
High	75+75	75	38025	2597.5	75	38175	2612.5
	100+100	100	37952	2590.2	100	38150	2610
Note 1: Carriers in increasing frequency order.							

Table: Test frequencies for CA_41C(2555-2655MHz)

Range	CC-Combo / N_{RB_agg} [RB]	CC1 Note1			CC2 Note1		
		BW [RB]	$N_{UL/DL}$	$f_{UL/DL}$ [MHz]	BW [RB]	$N_{UL/DL}$	$f_{UL/DL}$ [MHz]
Low	50+100	50	40290	2560	100	40434	2574.4
		100	40340	2565	50	40484	2579.4
	75+75	75	41015	2632.5	75	41165	2647.5
	75+100	75	40315	2562.5	100	40486	2579.6
		100	40340	2565	75	40511	2582.1
	100+100	100	40340	2565	100	40538	2584.8
Mid	50+100	50	40640	2595	100	40784	2609.4
		100	40690	2600	50	40834	2614.4
	75+75	75	40665	2597.5	75	40815	2612.5
	75+100	75	40640	2595	100	40811	2612.1
		100	40665	2597.5	75	40836	2614.6
	100+100	100	40640	2595	100	40838	2614.8
High	50+100	50	40996	2630.6	100	41140	2645
		100	41046	2635.6	50	41190	2650
	75+75	75	40315	2562.5	75	40465	2577.5
	75+100	75	40969	2627.9	100	41140	2645
		100	40994	2630.4	75	41165	2647.5
	100+100	100	40942	2625.2	100	41140	2645
Note 1: Carriers in increasing frequency order.							