FCC SAR Test Report

APPLICANT	:	Samsung Electronics Co., Ltd.
EQUIPMENT	:	Tablet PC
BRAND NAME	:	SAMSUNG
MODEL NAME	:	SM-P555C
FCC ID	:	A3LSMP555C
STANDARD	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2003

We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (SHENZHEN) INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
2353

SPORTON INTERNATIONAL (SHENZHEN) INC.
1F & 2F,Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town, Nanshan District, Shenzhen, Guangdong, P. R. China

Table of Contents

1. Statement of Compliance **4**
2. Administration Data **5**
3. Guidance Standard **5**
4. Equipment Under Test (EUT) **6**
4.1 General Information 6
4.2 Maximum Tune-up Limit 7
4.3 General LTE SAR Test and Reporting Considerations 8
5. Additional Test Positions due to Proximity Sensor **9**
6. RF Exposure Limits **9**
6.1 Uncontrolled Environment 9
6.2 Controlled Environment 9
7. Specific Absorption Rate (SAR) **10**
7.1 Introduction 10
7.2 SAR Definition 10
8. System Description and Setup **11**
9. Measurement Procedures **12**
9.1 Spatial Peak SAR Evaluation 12
9.2 Power Reference Measurement 13
9.3 Area Scan 13
9.4 Zoom Scan 14
9.5 Volume Scan Procedures 14
9.6 Power Drift Monitoring 14
10. Test Equipment List **15**
11. System Verification **16**
11.1 Tissue Verification 16
11.2 System Performance Check Results 18
12. RF Exposure Positions **19**
12.1 SAR Testing for Body 19
13. Conducted RF Output Power (Unit: dBm) **20**
14. Antenna Location **34**
15. SAR Test Results **37**
15.1 Body SAR 38
15.2 Repeated SAR Measurement 40
16. Simultaneous Transmission Analysis **41**
16.1 Body Exposure Conditions 42
16.2 SPLSR Evaluation and Analysis 45
17. Uncertainty Assessment **50**
18. References **53**
Appendix A. Plots of System Performance Check
Appendix B. Plots of High SAR Measurement
Appendix C. DASY Calibration Certificate
Appendix D. SAR System Validation
Appendix E. Test Setup Photos
Appendix F. Proximity Sensor Triggering Data Summary

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA531006	Rev. 01	Initial issue of report	Apr. 16, 2015

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Samsung Electronics Co., Ltd., Tablet PC, SM-P555C,** are as follows.

Equipment Class	Frequency Band	Highest SAR Summary	
		Body 1g SAR (W/kg)	Highest Simultaneous Transmission Body 1g SAR (W/kg)
PCB	GSM850	0.52	1.59
	GSM1900	1.01	
	WCDMA Band V	0.88	
	WCDMA Band II	**1.08**	
	LTE Band 41	1.01	
DTS	WLAN 2.4GHz Band	0.79	1.35
DSS	Bluetooth	0.76	1.32
NII	WLAN 5.2GHz Band	0.75	1.59
	WLAN 5.3GHz Band	0.80	
	WLAN 5.8GHz Band	1.03	
Date of Testing		Apr. 04, 2015 ~ Apr. 05, 2015	

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003.

2. Administration Data

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.
Test Site Location	1F & 2F,Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595

Applicant	
Company Name	Samsung Electronics Co., Ltd.
Address	No.9 WeiWu Rd, Micro Electronic Industrial Park, Jingang Highway, Xiqing District, Tianjin, China

Manufacturer	
Company Name	Samsung Electronics Co., Ltd.
Address	No.9 WeiWu Rd, Micro Electronic Industrial Park, Jingang Highway, Xiqing District, Tianjin, China

3. Guidance Standard

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2003
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- FCC KDB 865664 D02 SAR Reporting v01r01
- FCC KDB 447498 D01 General RF Exposure Guidance v05r02
- FCC KDB 248227 D01 SAR meas for 802 11abg v01r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r01
- FCC KDB 941225 D01 3G SAR Procedures v03
- FCC KDB 941225 D05 SAR for LTE Devices v02r03

4. Equipment Under Test (EUT)

4.1 General Information

Product Feature & Specification	
Equipment Name	Tablet PC
Brand Name	SAMSUNG
Model Name	SM-P555C
FCC ID	A3LSMP555C
IMEI Code	354171050000364
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz LTE Band 41: 2557.5 MHz ~ 2652.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5805 MHz Bluetooth: 2402 MHz ~ 2480 MHz ANT+: 2402 MHz ~ 2480 MHz
Mode	• GSM/GPRS/EGPRS • RMC/AMR 12.2Kbps • HSDPA • HSUPA • DC-HSDPA • LTE • WLAN 2.4GHz 802.11b/g/n HT20 • WLAN 5GHz 802.11a/n HT20/HT40 • Bluetooth v3.0 + EDR, Bluetooth v4.0 LE • ANT+: 2402 MHz ~ 2480 MHz
HW Version	REV1.0
SW Version	P555C.001
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype

Remark:

1. 802.11n-HT40 is not supported in 2.4GHz WLAN.
2. This device 2.4GHz WLAN supports hotspot operation, 5.8GHz WLAN supports WiFi Direct (GC/GO), and 5.2GHz / 5.3GHz supports WiFi Direct (GC only).
3. The HSPA+ does not support 16QAM uplink.
4. This device supports GRPS/EGPRS mode up to multi-slot class33 and does not support DTM operation.
5. The voice is only limited to speakerphone mode and it does not supported near to the ear voice mode during normal using.

4.2 Maximum Tune-up Limit

Mode	Burst Average Power (dBm)			
	GSM850		GSM1900	
Output Power Status	Full power mode	Reduced power mode	Full power mode	Reduced power mode
GSM (GMSK, 1 Tx slot)	35.0	21.0	31.5	20.5
GPRS (GMSK, 1 Tx slot)	35.0	21.0	31.5	20.5
GPRS (GMSK, 2 Tx slots)	30.5	21.0	30.0	20.5
GPRS (GMSK, 3 Tx slots)	29.5	21.0	27.5	20.5
GPRS (GMSK, 4 Tx slots)	27.5	21.0	26.5	20.5
EDGE (8PSK, 1 Tx slot)	27.5	20.0	28.0	19.5
EDGE (8PSK, 2 Tx slots)	26.5	20.0	27.0	19.5
EDGE (8PSK, 3 Tx slots)	25.5	20.0	26.0	19.5
EDGE (8PSK, 4 Tx slots)	24.5	20.0	25.0	19.5

Mode	Average Power (dBm)			
	WCDMA Band V		WCDMA Band II	
Output Power Status	Full power mode	Reduced power mode	Full power mode	Reduced power mode
RMC/AMR 12.2Kbps	23.5	20.5	23.0	15.0
HSDPA	22.5	20.0	22.0	14.5
HSUPA	22.5	19.5	22.0	14.0
DC-HSDPA	22.5	20.0	22.0	14.5

Mode	Average Power (dBm)	
LTE Band 41	Full power mode	Reduced power mode
	23.5	15.5

Mode			Average Power (dBm)
2.4GHz	802.11b		10.0
	802.11g		11.0
	802.11n-HT20		10.0
5GHz	802.11a	5.2GHz	11.0
		5.3GHz	11.5
		5.8GHz	9.5
	802.11n-HT20	5.2GHz	10.5
		5.3GHz	11.5
		5.8GHz	9.5
	802.11n-HT40	5.2GHz	9.0
		5.3GHz	9.0
		5.8GHz	7.5
Bluetooth v3.0 + EDR			10.5
Bluetooth v4.0 LE			2.5

4.3 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r03	
FCC ID	A3LSMP555C
Equipment Name	Tablet PC
Operating Frequency Range of each LTE transmission band	LTE Band 41: 2557.5 MHz ~ 2652.5 MHz
Channel Bandwidth	5MHz, 10MHz, 15MHz, 20MHz
uplink modulations used	QPSK, and 16QAM
LTE Voice / Data requirements	Data only
LTE MPR permanently built-in by design	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
Power reduction applied to satisfy SAR compliance	Yes, proximity sensor.

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 41								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
Low	40265	2557.5	40290	2560	40315	2562.5	40340	2565
Low-Middle	40581	2589.1	40590	2590	40598	2590.8	40607	2591.7
Middle	40897	2620.7	40890	2620	40881	2619.1	40874	2618.4
High	41215	2652.5	41190	2650	41165	2647.5	41140	2645

5. Additional Test Positions due to Proximity Sensor

FCC KDB 616217 D04 Section 6 was used as guideline for selecting SAR test distance for this device at these additional exposure conditions. Since the proximity sensor activation distance for the bottom face of the device is 16mm, a conservative distance 15mm was tested for SAR on the bottom face at maximum power. Since the proximity sensor activation distance for the edge 3 of the device is 6mm, a conservative distance 5mm was tested for SAR on the edge 3 at maximum power. Sensor triggering distance summary data is included in Appendix F.

6. RF Exposure Limits

6.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

6.2 Controlled Environment

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). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

7. Specific Absorption Rate (SAR)

7.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

7.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

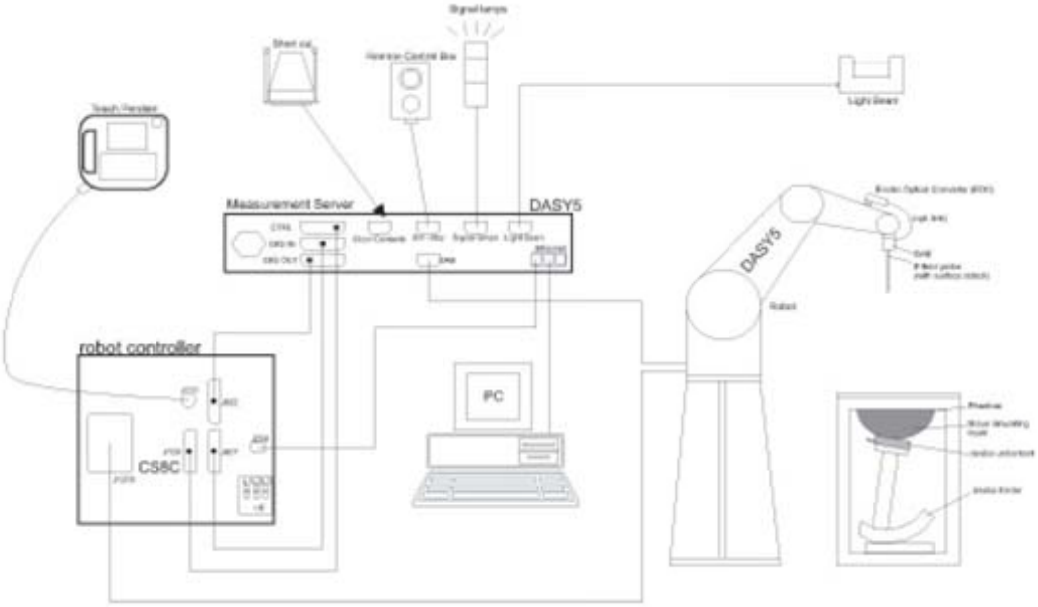
SAR is expressed in units of Watts per kilogram (W/kg)

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^{\mathbf{2}}}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

8. System Description and Setup

The DASY system used for performing compliance tests consists of the following items:



<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	 **Photo of SAM Phantom**

- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

9.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

9.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

9.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

9.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

9.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

9.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

10. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d091	Nov. 21, 2014	Nov. 20, 2015
SPEAG	1900MHz System Validation Kit	D1900V2	5d118	Nov. 21, 2014	Nov. 20, 2015
SPEAG	2450MHz System Validation Kit	D2450V2	840	Nov. 19, 2014	Nov. 18, 2015
SPEAG	2600MHz System Validation Kit	D2600V2	1061	Nov. 19, 2014	Nov. 18, 2015
SPEAG	5000MHz System Validation Kit	D5GHzV2	1113	Nov. 24, 2014	Nov. 23, 2015
SPEAG	Data Acquisition Electronics	DAE4	1303	Dec. 11, 2014	Dec. 10, 2015
SPEAG	Dosimetric E-Field Probe	EX3DV4	3819	Nov. 13, 2014	Nov. 12, 2015
SPEAG	ELI4 Phantom	QD OVA 002 AA	TP-1149	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201300653	Jul. 17, 2014	Jul. 16, 2015
Agilent	Wireless Communication Test Set	E5515C	MY50267224	Sep. 29, 2014	Sep. 28, 2015
Agilent	Wireless Communication Test Set	E5515E	MY53211040	Jun. 12, 2014	Jun. 11, 2015
R&S	Network Analyzer	ZVB8	100106	Sep. 29, 2014	Sep. 28, 2015
SPEAG	Dielectric Assessment KIT	DAK-3.5	1032	NCR	NCR
R&S	Signal Generator	SMBV100A	258305	Jan. 23, 2015	Jan. 22, 2016
mini-circuits	Amplifier	ZVE-3W-83+	162601250	NCR	NCR
Anritsu	Power Sensor	MA2411B	1207253	Jan. 28, 2015	Jan. 27, 2016
Anritsu	Power Meter	ML2495A	1218010	Jan. 28, 2015	Jan. 27, 2016
ARRA	Power Divider	A3200-2	N/A	NA	NA
R&S	CBT BLUETOOTH TESTER	CBT	100783	Aug. 11, 2014	Aug. 10, 2015
R&S	Spectrum Analyzer	FSP30	101362	Sep. 29, 2014	Sep. 28, 2015
Agilent	Dual Directional Coupler	778D	50422	Note1	
Woken	Attenuator 1	WK0602-XX	N/A	Note1	
PE	Attenuator 2	PE7005-10	N/A	Note1	
PE	Attenuator 3	PE7005- 3	N/A	Note1	
AR	Power Amplifier	5S1G4M2	0328767	Note1	
Mini-Circuits	Power Amplifier	ZVE-3W	162601250	Note1	
Mini-Circuits	Power Amplifier	ZHL-42W+	13440021344	Note1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. Referring to KDB 865664 D01v01r03, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

11. System Verification

11.1 Tissue Verification

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm; For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which are show as followings.

Photo of Liquid Height for Head SAR

Photo of Liquid Height for Body SAR

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Body								
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
835	Body	22.6	0.998	54.379	0.97	55.20	2.89	-1.49	±5	Apr. 04, 2015
1900	Body	22.7	1.528	54.867	1.52	53.30	0.53	2.94	±5	Apr. 05, 2015
2450	Body	22.6	1.992	52.302	1.95	52.70	2.15	-0.76	±5	Apr. 04, 2015
2600	Body	22.8	2.209	51.123	2.16	52.50	2.27	-2.62	±5	Apr. 04, 2015
5200	Body	22.6	5.285	49.218	5.30	49.00	-0.28	0.44	±5	Apr. 05, 2015
5300	Body	22.7	5.423	49.055	5.42	48.90	0.06	0.32	±5	Apr. 05, 2015
5800	Body	22.8	6.148	47.973	6.00	48.20	2.47	-0.47	±5	Apr. 05, 2015

11.2 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured SAR (W/kg)	Targeted SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
Apr. 04, 2015	835	Body	250	4d091	3819	1303	2.48	9.60	9.92	3.33
Apr. 05, 2015	1900	Body	250	5d118	3819	1303	10.80	40.00	43.2	8.00
Apr. 04, 2015	2450	Body	250	840	3819	1303	12.40	51.00	49.6	-2.75
Apr. 04, 2015	2600	Body	250	1061	3819	1303	14.80	54.90	59.2	7.83
Apr. 05, 2015	5200	Body	100	1113	3819	1303	8.15	74.90	81.5	8.81
Apr. 05, 2015	5300	Body	100	1113	3819	1303	8.36	77.80	83.6	7.46
Apr. 05, 2015	5800	Body	100	1113	3819	1303	7.83	75.40	78.3	3.85

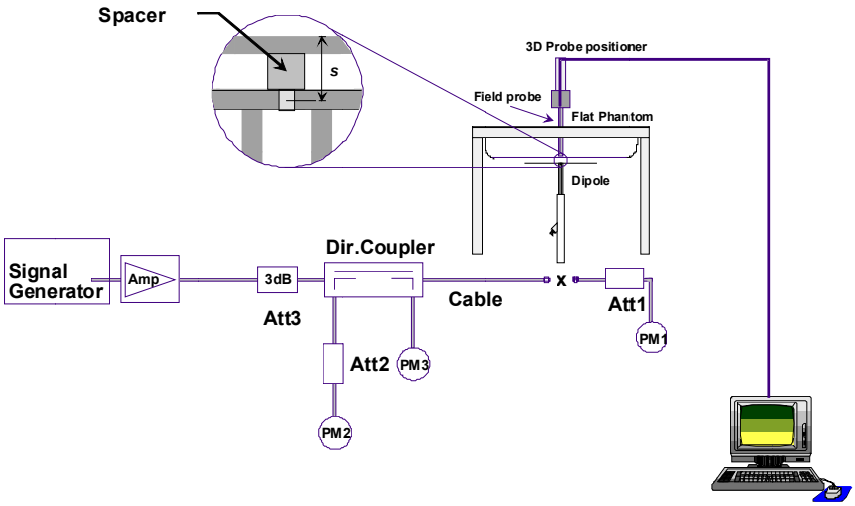


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

12. RF Exposure Positions

12.1 SAR Testing for Body

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v05r02 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

13. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

General Note:

1. Per KDB 447498 D01v05r02, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. For body SAR testing was following KDB 941225 D01v03, the GPRS (1Tx slots) mode was selected when EUT operating without power back-off, the GPRS (4Tx slots) mode was selected when EUT operating with power back-off for GSM850, and the GPRS (2Tx slots) mode was selected when EUT operating without power back-off, the GPRS (4Tx slots) mode was selected when EUT operating with power back-off for GSM1900,according to the highest frame-average power.

Maximum Average RF Power (Proximity Sensor Inactive)

Band GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM (GMSK, 1 Tx slot)	34.45	34.47	34.48	35.0	25.45	25.47	25.48	26.0
GPRS (GMSK, 1 Tx slot) – CS1	34.44	34.46	34.47	35.0	25.44	25.46	25.47	**26.0**
GPRS (GMSK, 2 Tx slots) – CS1	29.95	29.96	30.03	30.5	23.95	23.96	24.03	24.5
GPRS (GMSK, 3 Tx slots) – CS1	28.79	28.89	28.92	29.5	24.53	24.63	24.66	25.24
GPRS (GMSK, 4 Tx slots) – CS1	26.85	27.11	27.18	27.5	23.85	24.11	24.18	24.5
EDGE (8PSK, 1 Tx slot) – MCS5	26.80	26.82	26.97	27.5	17.80	17.82	17.97	18.5
EDGE (8PSK, 2 Tx slots) – MCS5	25.84	25.86	25.96	26.5	19.84	19.86	19.96	20.5
EDGE (8PSK, 3 Tx slots) – MCS5	24.95	24.96	25.06	25.5	20.69	20.70	20.80	21.24
EDGE (8PSK, 4 Tx slots) – MCS5	24.02	24.15	24.17	24.5	21.02	21.15	21.17	21.5
Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM (GMSK, 1 Tx slot)	30.57	30.58	31.27	31.5	21.57	21.58	22.27	22.5
GPRS (GMSK, 1 Tx slot) – CS1	30.55	30.56	31.20	31.5	21.55	21.56	22.20	22.5
GPRS (GMSK, 2 Tx slots) – CS1	29.03	29.05	29.61	30.0	23.03	23.05	23.61	**24.0**
GPRS (GMSK, 3 Tx slots) – CS1	26.82	26.83	27.33	27.5	22.56	22.57	23.07	23.24
GPRS (GMSK, 4 Tx slots) – CS1	25.53	25.56	26.14	26.5	22.53	22.56	23.14	23.5
EDGE (8PSK, 1 Tx slot) – MCS5	26.92	26.94	27.30	28.0	17.92	17.94	18.30	19.0
EDGE (8PSK, 2 Tx slots) – MCS5	25.93	25.94	26.25	27.0	19.93	19.94	20.25	21.0
EDGE (8PSK, 3 Tx slots) – MCS5	24.90	24.92	25.22	26.0	20.64	20.66	20.96	21.74
EDGE (8PSK, 4 Tx slots) – MCS5	23.88	23.90	24.20	25.0	20.88	20.90	21.20	22.0

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

Reduced Average RF Power (Proximity Sensor Active)

Band GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM (GMSK, 1 Tx slot)	19.92	20.15	20.16	21.0	10.92	11.15	11.16	12.0
GPRS (GMSK, 1 Tx slot) – CS1	19.91	20.14	20.15	21.0	10.91	11.14	11.15	12.0
GPRS (GMSK, 2 Tx slots) – CS1	20.02	20.34	20.35	21.0	14.02	14.34	14.35	15.0
GPRS (GMSK, 3 Tx slots) – CS1	20.23	20.45	20.47	21.0	15.97	16.19	16.21	16.74
GPRS (GMSK, 4 Tx slots) – CS1	20.37	20.56	20.58	21.0	17.37	17.56	17.58	**18.0**
EDGE (8PSK, 1 Tx slot) – MCS5	18.96	19.11	19.33	20.0	9.96	10.11	10.33	11.0
EDGE (8PSK, 2 Tx slots) – MCS5	19.17	19.31	19.45	20.0	13.17	13.31	13.45	14.0
EDGE (8PSK, 3 Tx slots) – MCS5	19.28	19.43	19.58	20.0	15.02	15.17	15.32	15.74
EDGE (8PSK, 4 Tx slots) – MCS5	19.35	19.49	19.69	20.0	16.35	16.49	16.69	17.0
Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM (GMSK, 1 Tx slot)	19.05	19.18	19.53	20.5	10.05	10.18	10.53	11.5
GPRS (GMSK, 1 Tx slot) – CS1	19.04	19.16	19.51	20.5	10.04	10.16	10.51	11.5
GPRS (GMSK, 2 Tx slots) – CS1	19.13	19.35	19.57	20.5	13.13	13.35	13.57	14.5
GPRS (GMSK, 3 Tx slots) – CS1	19.39	19.48	19.78	20.5	15.13	15.22	15.52	16.24
GPRS (GMSK, 4 Tx slots) – CS1	19.49	19.51	19.87	20.5	16.49	16.51	16.87	**17.5**
EDGE (8PSK, 1 Tx slot) – MCS5	18.20	18.40	18.42	19.5	9.20	9.40	9.42	10.5
EDGE (8PSK, 2 Tx slots) – MCS5	18.55	18.62	18.67	19.5	12.55	12.62	12.67	13.5
EDGE (8PSK, 3 Tx slots) – MCS5	18.65	18.77	18.78	19.5	14.39	14.51	14.52	15.24
EDGE (8PSK, 4 Tx slots) – MCS5	18.87	18.81	18.85	19.5	15.87	15.81	15.85	16.5

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the 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 RMC 12.2Kbps + 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 Delta ACK, Delta NACK and Delta CQI = 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 (dB) (Note 3)	MPR (dB) (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

HSUPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the 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

DC-HSDPA 3GPP release 8 Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration below
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 RMC 12.2Kbps + HSDPA mode.
   ii. Set Cell Power = -25 dBm
   iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
   iv. Select HSDPA Uplink Parameters
   v. Set Gain Factors (β_c and β_d) and parameters were set according to each Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
      a). Subtest 1: β_c/β_d=2/15
      b). Subtest 2: β_c/β_d=12/15
      c). Subtest 3: β_c/β_d=15/8
      d). Subtest 4: β_c/β_d=15/4
   vi. Set Delta ACK, Delta NACK and Delta CQI = 8
   vii. Set Ack-Nack Repetition Factor to 3
   viii. Set CQI Feedback Cycle (k) to 4 ms
   ix. Set CQI Repetition Factor to 2
   x. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
A summary of these settings are illustrated below:

C.8.1.12 Fixed Reference Channel Definition H-Set 12

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table.		
Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

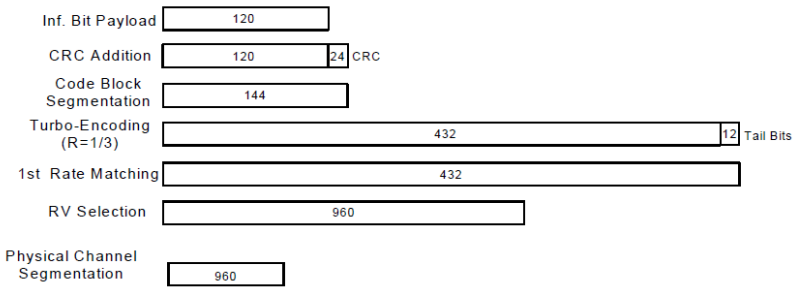


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

<WCDMA Conducted Power>

General Note:

1. Per KDB 941225 D01v03, SAR for Head / Body exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03, RMC 12.2kbps setting is used to evaluate SAR when EUT operating without power back-off and operating with power back-off. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA/DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA/DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA/DC-HSDPA.

Maximum Average RF Power (Proximity Sensor Inactive)

Band			WCDMA Band V			WCDMA Band II		
Tx Channel			4132	4182	4233	9262	9400	9538
Frequency (MHz)			826.4	836.4	846.6	1852.4	1880	1907.6
MPR (dB)	3GPP Rel 99	AMR 12.2Kbps	22.92	22.98	22.78	22.70	22.67	22.65
	3GPP Rel 99	RMC 12.2Kbps	22.93	**22.99**	22.79	**22.71**	22.68	22.66
0	3GPP Rel 6	HSDPA Subtest-1	22.09	22.16	22.14	21.47	21.59	21.50
0	3GPP Rel 6	HSDPA Subtest-2	22.14	22.25	22.13	21.43	21.70	21.53
0.5	3GPP Rel 6	HSDPA Subtest-3	21.63	21.76	21.59	20.92	21.22	21.05
0.5	3GPP Rel 6	HSDPA Subtest-4	21.64	21.76	21.65	20.92	21.21	21.04
0	3GPP Rel 8	DC-HSDPA Subtest-1	22.11	22.05	22.13	21.48	21.58	21.62
0	3GPP Rel 8	DC-HSDPA Subtest-2	22.01	22.12	22.09	21.41	21.61	21.54
0.5	3GPP Rel 8	DC-HSDPA Subtest-3	21.67	21.65	21.71	20.99	21.13	21.15
0.5	3GPP Rel 8	DC-HSDPA Subtest-4	21.64	21.71	21.75	20.90	21.07	21.01
0	3GPP Rel 6	HSUPA Subtest-1	22.02	21.52	21.29	21.48	21.05	21.31
2	3GPP Rel 6	HSUPA Subtest-2	20.66	20.16	19.95	19.98	19.65	20.04
1	3GPP Rel 6	HSUPA Subtest-3	19.84	19.84	19.63	19.18	19.26	19.29
2	3GPP Rel 6	HSUPA Subtest-4	21.37	20.97	21.16	20.26	20.72	20.70
0	3GPP Rel 6	HSUPA Subtest-5	22.20	22.20	21.90	21.50	21.50	21.50

Reduced Average RF Power (Proximity Sensor Active)

Band			WCDMA Band V			WCDMA Band II		
Tx Channel			4132	4182	4233	9262	9400	9538
Frequency (MHz)			826.4	836.4	846.6	1852.4	1880	1907.6
MPR (dB)	3GPP Rel 99	AMR 12.2Kbps	20.16	20.17	19.97	14.70	14.41	14.24
	3GPP Rel 99	RMC 12.2Kbps	20.17	**20.18**	19.98	**14.71**	14.43	14.26
0	3GPP Rel 6	HSDPA Subtest-1	19.31	19.42	19.23	13.74	13.60	13.36
0	3GPP Rel 6	HSDPA Subtest-2	19.42	19.48	19.38	13.75	13.60	13.38
0.5	3GPP Rel 6	HSDPA Subtest-3	18.93	18.97	18.87	13.24	13.09	12.52
0.5	3GPP Rel 6	HSDPA Subtest-4	18.93	18.98	18.87	13.28	13.09	12.87
0	3GPP Rel 8	DC-HSDPA Subtest-1	18.68	18.86	18.66	13.23	12.74	12.62
0	3GPP Rel 8	DC-HSDPA Subtest-2	18.77	18.85	18.68	13.21	12.74	12.61
0.5	3GPP Rel 8	DC-HSDPA Subtest-3	18.66	18.84	18.62	13.22	12.73	12.61
0.5	3GPP Rel 8	DC-HSDPA Subtest-4	18.77	18.85	18.63	13.21	12.70	12.60
0	3GPP Rel 6	HSUPA Subtest-1	18.77	18.96	18.76	13.62	12.93	12.90
2	3GPP Rel 6	HSUPA Subtest-2	17.52	17.72	17.53	12.12	11.55	11.60
1	3GPP Rel 6	HSUPA Subtest-3	17.08	17.93	17.00	11.33	11.16	10.87
2	3GPP Rel 6	HSUPA Subtest-4	18.25	17.90	18.14	12.33	12.60	12.23
0	3GPP Rel 6	HSUPA Subtest-5	19.40	19.50	19.30	13.80	13.35	13.16

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

SAR was tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

a. 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
b. "special subframe S" contains both uplink and downlink transmissions, it has been taken into consideration to determine the transmission duty factor according to the worst case uplink and downlink cyclic prefix requirements for UpPTS
c. Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Anritsu MT8820C (firmware: #22.52#004) was used for LTE output power measurements and SAR testing.

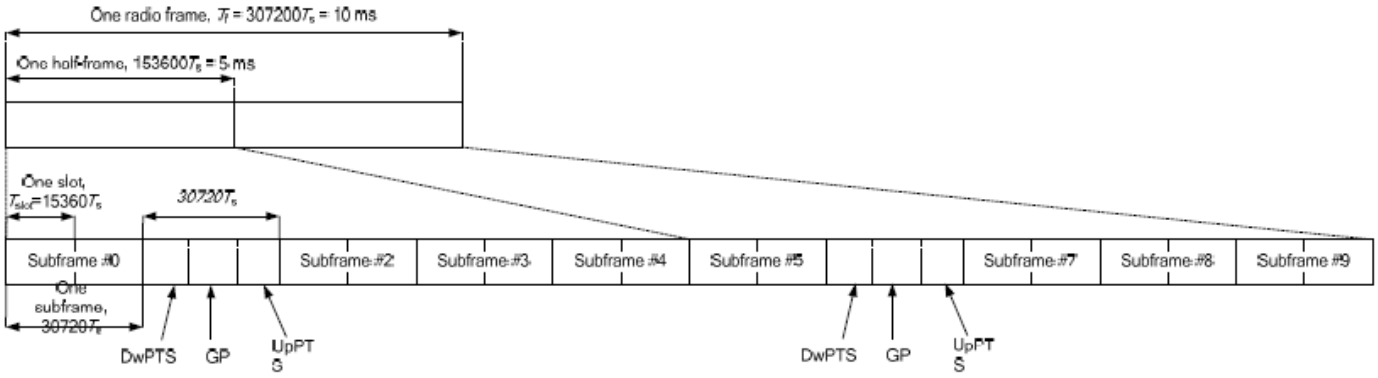


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Special subframe (30720·T_s): Normal cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~4**	7.13%	8.33%
	5~9	14.3%	16.7%

Special subframe(30720·T_s): Extended cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~3**	7.13%	8.33%
	4~7	14.3%	16.7%

The highest duty factor is resulted from:

i. Uplink-downlink configuration: 0. In a half-frame consisted of 5 subfames, uplink operation is in 3 uplink subframes and 1 special subframe.

ii. special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink

iii. for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.167)/5 = 63.3%

iv. for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.143)/5 = 62.9%

v. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.

<LTE Band 41>

Maximum Average RF Power (Proximity Sensor Inactive)

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low-Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				40340	40607	40874	41140		
Frequency (MHz)				2565	2591.7	2618.4	2645		
20	QPSK	1	0	22.76	22.53	**22.81**	22.57	23.5	0
20	QPSK	1	49	22.48	22.28	22.66	22.16		
20	QPSK	1	99	22.74	22.50	22.50	22.00		
20	QPSK	50	0	21.68	21.45	21.70	21.57	22.5	1
20	QPSK	50	24	21.49	21.37	21.52	21.35		
20	QPSK	50	49	21.46	21.38	21.44	21.37		
20	QPSK	100	0	21.55	21.39	21.60	21.41		
20	16QAM	1	0	21.85	21.43	21.81	21.68	22.5	1
20	16QAM	1	49	21.84	21.38	21.80	21.43		
20	16QAM	1	99	21.66	21.65	21.60	21.38		
20	16QAM	50	0	20.46	20.60	20.66	20.42	21.5	2
20	16QAM	50	24	20.38	20.29	20.43	20.32		
20	16QAM	50	49	20.35	20.27	20.45	20.33		
20	16QAM	100	0	20.53	20.40	20.46	20.38		
Channel				40315	40598	40881	41165	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2562.5	2590.8	2619.1	2647.5		
15	QPSK	1	0	22.48	22.49	22.45	22.42	23.5	0
15	QPSK	1	37	22.46	22.44	22.48	22.38		
15	QPSK	1	74	22.41	22.46	22.47	22.27		
15	QPSK	36	0	22.45	22.47	22.46	22.37	22.5	1
15	QPSK	36	18	22.45	22.47	22.42	22.41		
15	QPSK	36	37	22.43	22.42	22.46	22.37		
15	QPSK	75	0	21.44	21.38	21.60	21.54		
15	16QAM	1	0	21.46	21.49	21.46	21.75	22.5	1
15	16QAM	1	37	21.45	21.32	21.47	21.71		
15	16QAM	1	74	21.44	21.45	21.45	21.61		
15	16QAM	36	0	21.47	21.16	21.40	21.34	21.5	2
15	16QAM	36	18	21.45	21.42	21.44	21.33		
15	16QAM	36	37	21.44	21.46	21.41	21.33		
15	16QAM	75	0	20.84	20.42	20.82	20.50		

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low-Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				40290	40590	40890	41190		
Frequency (MHz)				2560	2590	2620	2650		
10	QPSK	1	0	22.56	22.29	22.68	22.51	23.5	0
10	QPSK	1	24	22.36	22.13	22.74	22.25		
10	QPSK	1	49	22.53	22.50	22.38	22.08		
10	QPSK	25	0	21.50	21.40	21.53	21.52	22.5	1
10	QPSK	25	12	21.44	21.28	21.37	21.41		
10	QPSK	25	24	21.54	21.37	21.36	21.28		
10	QPSK	50	0	21.53	21.34	21.33	21.45		
10	16QAM	1	0	21.87	21.55	21.55	21.74	22.5	1
10	16QAM	1	24	21.51	21.55	21.73	21.45		
10	16QAM	1	49	21.74	21.73	21.60	21.37		
10	16QAM	25	0	20.71	20.34	20.77	20.40	21.5	2
10	16QAM	25	12	20.77	20.63	20.68	20.57		
10	16QAM	25	24	20.33	20.65	20.68	20.37		
10	16QAM	50	0	20.29	20.28	20.55	20.43		
Channel				40265	40581	40897	41215	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2557.5	2589.1	2620.7	2652.5		
5	QPSK	1	0	22.29	22.44	22.46	22.43	23.5	0
5	QPSK	1	12	22.41	22.50	22.39	22.39		
5	QPSK	1	24	22.45	22.42	22.25	22.00		
5	QPSK	12	0	21.48	21.34	21.33	21.40	22.5	1
5	QPSK	12	6	21.42	21.28	21.41	21.26		
5	QPSK	12	11	21.47	21.35	21.31	21.29		
5	QPSK	25	0	21.51	21.34	21.39	21.31		
5	16QAM	1	0	21.53	21.47	21.54	21.55	22.5	1
5	16QAM	1	12	21.41	21.48	21.52	21.22		
5	16QAM	1	24	21.55	21.32	21.49	21.10		
5	16QAM	12	0	20.55	20.48	20.23	20.25	21.5	2
5	16QAM	12	6	20.30	20.54	20.21	20.29		
5	16QAM	12	11	20.54	20.50	20.20	20.15		
5	16QAM	25	0	20.63	20.50	20.62	20.23		

Note:
According to KDB 447498 D01v05r02 there are 4 default test channels in TDD LTE Band41.

Reduced Average RF Power (Proximity Sensor Active)

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low-Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				40340	40607	40874	41140		
Frequency (MHz)				2565	2591.7	2618.4	2645		
20	QPSK	1	0	14.78	14.72	**14.83**	14.74	15.5	0
20	QPSK	1	49	14.75	14.70	14.72	14.65		
20	QPSK	1	99	14.72	14.60	14.68	14.47		
20	QPSK	50	0	14.69	14.62	14.76	14.64	15.5	0
20	QPSK	50	24	14.67	14.55	14.74	14.63		
20	QPSK	50	49	14.64	14.59	14.71	14.62		
20	QPSK	100	0	14.70	14.58	14.72	14.67		
20	16QAM	1	0	14.75	14.63	14.75	14.72	15.5	0
20	16QAM	1	49	14.62	14.68	14.76	14.60		
20	16QAM	1	99	14.60	14.59	14.73	14.38		
20	16QAM	50	0	14.56	14.54	14.54	14.65	15.5	0
20	16QAM	50	24	14.52	14.47	14.59	14.61		
20	16QAM	50	49	14.63	14.45	14.61	14.58		
20	16QAM	100	0	14.68	14.52	14.65	14.64		
Channel				40315	40598	40881	41165	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2562.5	2590.8	2619.1	2647.5		
15	QPSK	1	0	14.73	14.58	14.61	14.65	15.5	0
15	QPSK	1	37	14.53	14.52	14.56	14.40		
15	QPSK	1	74	14.62	14.57	14.66	14.31		
15	QPSK	36	0	14.67	14.50	14.53	14.67	15.5	0
15	QPSK	36	18	14.50	14.48	14.49	14.53		
15	QPSK	36	37	14.54	14.54	14.49	14.40		
15	QPSK	75	0	14.57	14.51	14.58	14.43		
15	16QAM	1	0	14.71	14.53	14.81	14.70	15.5	0
15	16QAM	1	37	14.46	14.45	14.62	14.40		
15	16QAM	1	74	14.34	14.68	14.66	14.43		
15	16QAM	36	0	14.31	14.23	14.31	14.59	15.5	0
15	16QAM	36	18	14.53	14.21	14.23	14.54		
15	16QAM	36	37	14.49	14.25	14.19	14.42		
15	16QAM	75	0	14.42	14.50	14.45	14.44		

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low-Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				40290	40590	40890	41190		
Frequency (MHz)				2560	2590	2620	2650		
10	QPSK	1	0	14.60	14.37	14.80	14.47	15.5	0
10	QPSK	1	24	14.38	14.18	14.40	14.17		
10	QPSK	1	49	14.38	14.59	14.48	14.42		
10	QPSK	25	0	14.54	14.49	14.68	14.51	15.5	0
10	QPSK	25	12	14.57	14.49	14.63	14.38		
10	QPSK	25	24	14.52	14.61	14.56	14.41		
10	QPSK	50	0	14.55	14.54	14.62	14.50		
10	16QAM	1	0	14.68	14.38	14.79	14.68	15.5	0
10	16QAM	1	24	14.50	14.42	14.77	14.42		
10	16QAM	1	49	14.51	14.55	14.61	14.47		
10	16QAM	25	0	14.51	14.69	14.75	14.45	15.5	0
10	16QAM	25	12	14.58	14.68	14.78	14.41		
10	16QAM	25	24	14.53	14.67	14.77	14.35		
10	16QAM	50	0	14.44	14.30	14.51	14.36		
Channel				40265	40581	40897	41215	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2557.5	2589.1	2620.7	2652.5		
5	QPSK	1	0	14.65	14.45	14.69	14.48	15.5	0
5	QPSK	1	12	14.72	14.66	14.68	14.39		
5	QPSK	1	24	14.57	14.36	14.51	14.10		
5	QPSK	12	0	14.70	14.50	14.60	14.62	15.5	0
5	QPSK	12	6	14.51	14.35	14.55	14.51		
5	QPSK	12	11	14.59	14.48	14.50	14.37		
5	QPSK	25	0	14.56	14.42	14.53	14.46		
5	16QAM	1	0	14.73	14.49	14.81	14.69	15.5	0
5	16QAM	1	12	14.58	14.66	14.80	14.68		
5	16QAM	1	24	14.46	14.61	14.74	14.11		
5	16QAM	12	0	14.43	14.40	14.63	14.51	15.5	0
5	16QAM	12	6	14.37	14.35	14.45	14.49		
5	16QAM	12	11	14.50	14.40	14.49	14.45		
5	16QAM	25	0	14.53	14.43	14.43	14.42		

Note:
According to KDB 447498 D01v05r02 there are 4 default test channels in TDD LTE Band41.

<2.4GHz Bluetooth>

General Note:

1. Base on the same tune-up limit, for 2.4GHz Bluetooth SAR was selected v3.0 1Mbps to perform testing.
2. The duty factor is selected theoretical 83.3% perform Bluetooth SAR testing.

Bluetooth Burst Average Power (dBm)_DH5				
Channel	Frequency (MHz)	v3.0+EDR		
		1Mbps	2Mbps	3Mbps
CH 00	2402	**9.68**	7.97	7.98
CH 39	2441	**9.68**	8.06	8.08
CH 78	2480	9.27	7.59	7.60

Channel	Frequency (MHz)	Bluetooth Burst Average power (dBm)
		v4.0 LE
CH 00	2402	2.09
CH 19	2440	**2.19**
CH 39	2480	1.57

<WLAN Conducted Power>

General Note:

1. For 2.4GHz WLAN SAR testing, highest average RF output power channel for the lowest data rate for 802.11b were selected for SAR evaluation. 802.11n HT20 were verified at worse position of 802.11b mode since the average output powers over all channels and data rates were more than 0.25 dB higher than the tested channel in the lowest data rate of 802.11b mode.
2. Following KDB 248227 D01 v01r02, 802.11g average output power is higher than 1/4dB higher than 802.11b mode, these modes SAR will be verified at the highest RF exposure position found in 802.11b SAR testing.
3. For 5 GHz WLAN SAR testing, highest average RF output power channel for the lowest data rate for 802.11a were selected for SAR evaluation. 802.11n HT20/HT40 modes were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of 802.11a mode.

<2.4GHz WLAN>

WLAN 2.4GHz 802.11b Average Power (dBm)						
Power vs. Channel			Power vs. Data Rate			
Channel	Frequency (MHz)	Data Rate	Channel	2Mbps	5.5Mbps	11Mbps
		1Mbps				
CH 01	2412	7.08	CH 11	9.46	9.16	9.20
CH 06	2437	8.26				
CH 11	2462	**9.56**				

WLAN 2.4GHz 802.11g Average Power (dBm)											
Power vs. Channel			Power vs. Data Rate								
Channel	Frequency (MHz)	Data Rate	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps								
CH 01	2412	8.37	CH 11	10.38	10.36	10.41	10.44	10.37	10.43	10.41
CH 06	2437	10.17								
CH 11	2462	**10.48**								

WLAN 2.4GHz 802.11n HT20 Average Power (dBm)											
Power vs. Channel			Power vs. MCS Index								
Channel	Frequency (MHz)	MCS Index	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0								
CH 01	2412	7.64	CH 11	9.24	9.36	9.35	9.40	9.39	9.36	9.27
CH 06	2437	9.14								
CH 11	2462	**9.45**								

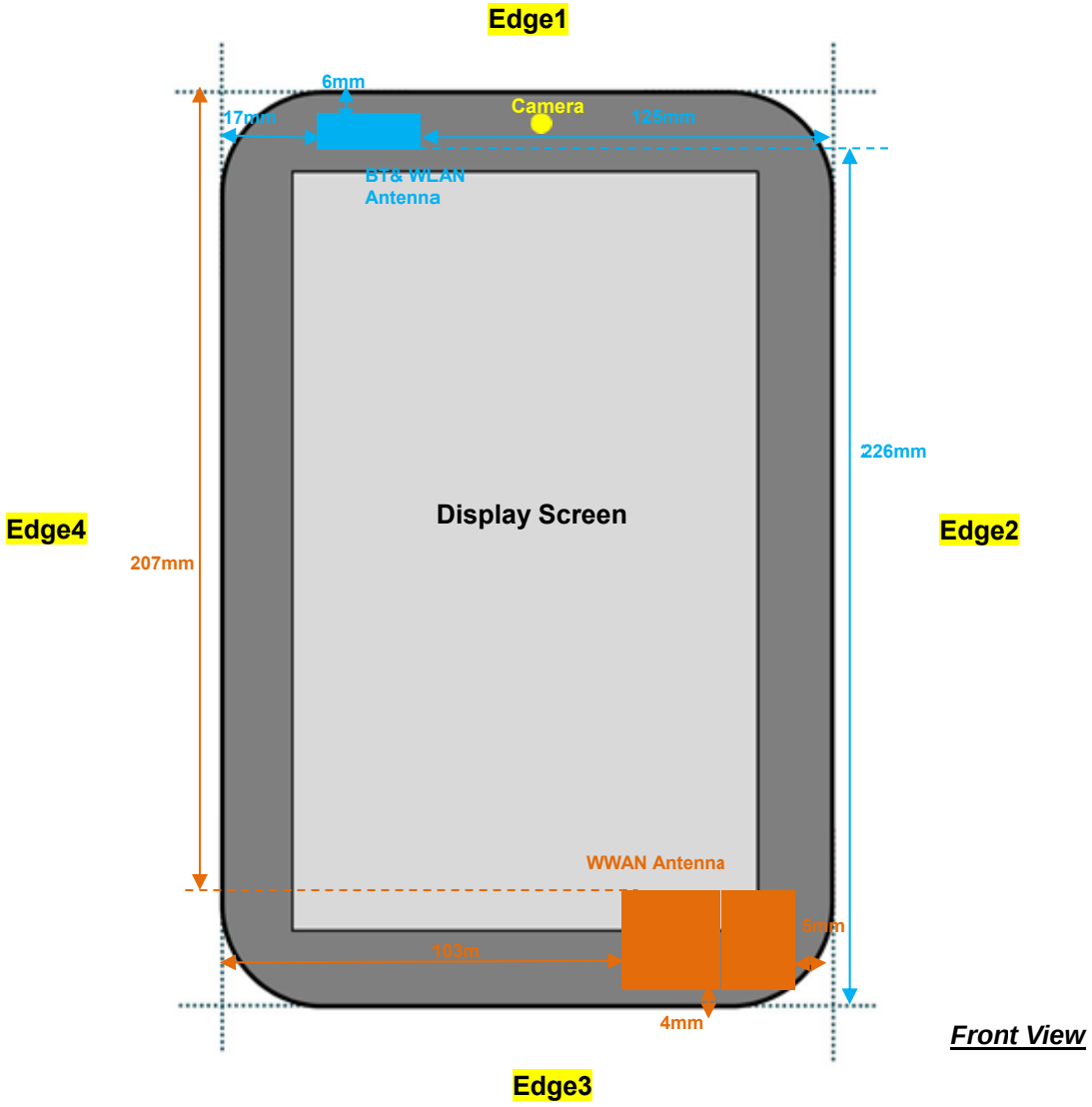
<5GHz WLAN>

WLAN 5GHz 802.11a Average Power (dBm)										
Power vs. Channel			Power vs. Data Rate							
Channel	Frequency (MHz)	Data Rate 6Mbps	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
CH 36	5180	9.96	CH 48	9.99	10.04	10.03	10.08	10.11	10.07	10.06
CH 40	5200	10.02								
CH 44	5220	10.05								
CH 48	5240	**10.24**								
CH 52	5260	10.32	CH 64	10.56	10.61	10.58	10.62	10.69	10.71	10.56
CH 56	5280	10.49								
CH 60	5300	10.74								
CH 64	5320	**10.96**								
CH 149	5745	8.96	CH 161	8.88	8.84	8.80	8.67	8.68	8.82	8.86
CH 153	5765	8.98								
CH 157	5785	9.04								
CH 161	5805	**9.07**								

WLAN 5GHz 802.11n HT20 Average Power (dBm)										
Power vs. Channel			Power vs. Data Rate							
Channel	Frequency (MHz)	Data Rate MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 36	5180	9.83	CH 48	10.07	10.07	10.13	10.16	10.06	10.15	10.12
CH 40	5200	9.92								
CH 44	5220	10.14								
CH 48	5240	**10.22**								
CH 52	5260	10.42	CH 64	10.82	10.81	10.85	10.83	10.66	10.85	10.86
CH 56	5280	10.56								
CH 60	5300	10.87								
CH 64	5320	**10.90**								
CH 149	5745	8.98	CH 161	8.95	8.95	8.97	8.91	8.90	8.92	8.93
CH 153	5765	8.86								
CH 157	5785	8.97								
CH 161	5805	**9.01**								

WLAN 5GHz 802.11n HT40 Average Power (dBm)										
Power vs. Channel			Power vs. Data Rate							
Channel	Frequency (MHz)	Data Rate MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 38	5190	8.09	CH 46	8.31	8.30	8.30	8.33	8.30	8.32	8.31
CH 46	5230	**8.35**								
CH 54	5270	8.44	CH 62	8.76	8.76	8.77	8.75	8.77	8.73	8.76
CH 62	5310	**8.79**								
CH 151	5755	**7.05**	CH 151	7.02	6.99	7.04	7.02	7.03	7.03	7.01
CH 159	5795	6.71								

14. Antenna Location



Diagonal Dimension: 286mm

General Note:

1. The below table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v05r02, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v05r02, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison
6. Per KDB 447498 D01v05r02, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

SAR test exclusion table distance is ≤ 50mm

Exposure Position	Wireless Interface	GPRS 850 1 Tx slots	GPRS 1900 2 Tx slots	WCDMA Band V	WCDMA Band II	LTE Band 41	WLAN 2.4GHz 802.11g	BT 2.4GHz	WLAN 5.3GHz 802.11a
	Calculated Frequency (MHz)	848.8	1909.8	846.6	1907.6	2652.5	2462	2480	5320
	Tune-up Maximum power (dBm)	26.0	24.0	23.5	23.0	23.5	11.0	10.5	11.5
Bottom Face	Antenna to user (mm)	0					0		
	SAR exclusion threshold	73.3	69.4	41.2	55.2	71.8	4.1	3.5	6.8
	SAR testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Edge 1	Antenna to user (mm)						6		
	SAR exclusion threshold						3.4	2.9	5.6
	SAR testing required?						**Yes**	**No**	**Yes**
Edge 2	Antenna to user (mm)	**5**							
	SAR exclusion threshold	73.3	69.4	41.2	55.2	71.8			
	SAR testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**			
Edge 3	Antenna to user (mm)	**4**							
	SAR exclusion threshold	73.3	69.4	41.2	55.2	71.8			
	SAR testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**			
Edge 4	Antenna to user (mm)						17		
	SAR exclusion threshold						1.2	1.0	2.0
	SAR testing required?						**No**	**No**	**No**

SAR test exclusion table distance is >50mm

Exposure Position	Wireless Interface	GPRS 850 1 Tx slots	GPRS 1900 2 Tx slots	WCDMA Band V	WCDMA Band II	LTE Band 41	WLAN 2.4GHz 802.11g	BT 2.4GHz	WLAN 5.3GHz 802.11a
	Calculated Frequency (MHz)	848.8	1909.8	846.6	1907.6	2652.5	2462	2480	5320
	Tune-up Maximum power (dBm)	26.0	24.0	23.5	23.0	23.5	11.0	10.5	11.5
	Tune-up Maximum rated power (mW)	398	251	224	200	224	13	11	14
Edge 1	Antenna to user (mm)	207							
	SAR exclusion threshold	1050.0	1679.0	1049.0	1679.0	1664.0			
	SAR testing required?	No	No	No	No	No			
Edge 2	Antenna to user (mm)						125		
	SAR exclusion threshold						846.0	846.0	812.0
	SAR testing required?						No	No	No
Edge 3	Antenna to user (mm)						226		
	SAR exclusion threshold						1856.0	1856.0	1822.0
	SAR testing required?						No	No	No
Edge 4	Antenna to user (mm)	103							
	SAR exclusion threshold	463.0	639.0	462.0	639.0	624.0			
	SAR testing required?	No	No	No	No	No			

15. SAR Test Results

General Note:

1. Per KDB 447498 D01v05r02, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. Duty cycle of TDD was fixed, therefore not require scaled to 100% of duty cycle. For SAR system, the crest factor 1:1.59 (62.9%) was used perform testing. Considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result.
   c. Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For TDD LTE Band: Reported SAR(W/kg)= Measured SAR(W/kg)* scaling factor for extended cyclic prefix * Tune-up scaling factor
2. Per KDB 447498 D01v05r02, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. For body SAR testing was following KDB 941225 D01v03, the GPRS (1Tx slots) mode was selected when EUT operating without power back-off, the GPRS (4Tx slots) mode was selected when EUT operating with power back-off for GSM850, and the GPRS (2Tx slots) mode was selected when EUT operating without power back-off, the GPRS (4Tx slots) mode was selected when EUT operating with power back-off for GSM1900, according to the highest frame-average power.
4. Per KDB 941225 D01v03, SAR for Head / Body exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
5. Per KDB 941225 D01v03, RMC 12.2kbps setting is used to evaluate SAR when EUT operating without power back-off and operating with power back-off. setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.
6. Per KDB 941225 D05v02r03, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
7. Per KDB 941225 D05v02r03, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
8. Per KDB 941225 D05v02r03, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
9. Per KDB 941225 D05v02r03, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r03, 16QAM SAR testing is not required.
10. Per KDB 941225 D05v02r03, smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r03, smaller bandwidth SAR testing is not required.
11. This device 2.4GHz WLAN supports hotspot operation, and 5.8GHz WLAN supports WiFi Direct (Group Client / Group Owner), and 5.2GHz / 5.3GHz supports WiFi Direct (Group Client only).
12. For the exposure positions that proximity sensor power reduction is applied for SAR compliance, additional SAR testing with EUT transmitting full power in normal mode was performed; 1.5cm for bottom face, 0.5cm for edge3

15.1 Body SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Power Back-off	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM850	GPRS(4 Tx slots)	Bottom Face	0	On	251	848.8	20.58	21.00	1.102	0.03	0.385	0.424
	GSM850	GPRS(4 Tx slots)	Edge 3	0	On	251	848.8	20.58	21.00	1.102	-0.06	0.146	0.161
	GSM850	GPRS(1 Tx slots)	Bottom Face	1.5	Off	251	848.8	34.47	35.00	1.130	0.05	0.249	0.281
01	GSM850	GPRS(1 Tx slots)	Edge 2	0	Off	251	848.8	34.47	35.00	1.130	0.09	0.456	**0.515**
	GSM850	GPRS(1 Tx slots)	Edge 3	0.5	Off	251	848.8	34.47	35.00	1.130	-0.03	0.251	0.284
02	GSM1900	GPRS(4 Tx slots)	Bottom Face	0	On	810	1909.8	19.87	20.50	1.156	0.01	0.871	**1.007**
	GSM1900	GPRS(4 Tx slots)	Edge 3	0	On	810	1909.8	19.87	20.50	1.156	0.09	0.189	0.219
	GSM1900	GPRS(2 Tx slots)	Bottom Face	1.5	Off	810	1909.8	29.61	30.00	1.094	-0.1	0.385	0.421
	GSM1900	GPRS(2 Tx slots)	Edge 2	0	Off	810	1909.8	29.61	30.00	1.094	0.13	0.805	0.881
	GSM1900	GPRS(2 Tx slots)	Edge 3	0.5	Off	810	1909.8	29.61	30.00	1.094	0.08	0.520	0.569
	GSM1900	GPRS(4 Tx slots)	Bottom Face	0	On	512	1850.2	19.49	20.50	1.262	0.02	0.781	0.985
	GSM1900	GPRS(4 Tx slots)	Bottom Face	0	On	661	1880	19.51	20.50	1.256	0.02	0.770	0.967
	GSM1900	GPRS(2 Tx slots)	Edge 2	0	Off	512	1850.2	29.03	30.00	1.250	-0.11	0.597	0.746
	GSM1900	GPRS(2 Tx slots)	Edge 2	0	Off	661	1880	29.05	30.00	1.245	-0.06	0.719	0.895

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Power Back-off	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA Band V	RMC 12.2Kbps	Bottom Face	0	On	4182	836.4	20.18	20.50	1.076	0.04	0.783	0.843
	WCDMA Band V	RMC 12.2Kbps	Edge 3	0	On	4182	836.4	20.18	20.50	1.076	0.02	0.223	0.240
	WCDMA Band V	RMC 12.2Kbps	Bottom Face	1.5	Off	4182	836.4	22.99	23.50	1.125	0.08	0.212	0.238
	WCDMA Band V	RMC 12.2Kbps	Edge 2	0	Off	4182	836.4	22.99	23.50	1.125	0.01	0.410	0.461
	WCDMA Band V	RMC 12.2Kbps	Edge 3	0.5	Off	4182	836.4	22.99	23.50	1.125	0.05	0.181	0.204
	WCDMA Band V	RMC 12.2Kbps	Bottom Face	0	On	4132	826.4	20.17	20.50	1.079	0.09	0.779	0.840
03	WCDMA Band V	RMC 12.2Kbps	Bottom Face	0	On	4233	846.6	19.98	20.50	1.127	0.04	0.776	**0.875**
	WCDMA Band II	RMC 12.2Kbps	Bottom Face	0	On	9262	1852.4	14.71	15.00	1.069	-0.02	0.528	0.564
	WCDMA Band II	RMC 12.2Kbps	Edge 3	0	On	9262	1852.4	14.71	15.00	1.069	0.04	0.097	0.104
	WCDMA Band II	RMC 12.2Kbps	Bottom Face	1.5	Off	9262	1852.4	22.71	23.00	1.069	0.06	0.433	0.463
	WCDMA Band II	RMC 12.2Kbps	Edge 2	0	Off	9262	1852.4	22.71	23.00	1.069	-0.09	0.854	0.913
	WCDMA Band II	RMC 12.2Kbps	Edge 3	0.5	Off	9262	1852.4	22.71	23.00	1.069	0.07	0.550	0.588
	WCDMA Band II	RMC 12.2Kbps	Edge 2	0	Off	9400	1880	22.68	23.00	1.076	-0.09	0.883	0.951
04	WCDMA Band II	RMC 12.2Kbps	Edge 2	0	Off	9538	1907.6	22.66	23.00	1.081	-0.11	1.000	**1.081**

<TDD LTE SAR>

Plot No.	Band	Mode	BW (MHz)	RB Size	RB Offset	Test Position	Gap	Power Back-off	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 41	QPSK	20M	1	0	Bottom Face	0	On	40874	2618.4	14.83	15.50	1.167	62.9	1.006	0.04	0.827	0.971
	LTE Band 41	QPSK	20M	1	0	Edge 3	0	On	40874	2618.4	14.83	15.50	1.167	62.9	1.006	0.04	0.227	0.266
	LTE Band 41	QPSK	20M	1	0	Bottom Face	1.5	Off	40874	2618.4	22.81	23.50	1.172	62.9	1.006	0.03	0.354	0.417
	LTE Band 41	QPSK	20M	1	0	Edge 2	0	Off	40874	2618.4	22.81	23.50	1.172	62.9	1.006	0.06	0.073	0.086
	LTE Band 41	QPSK	20M	1	0	Edge 3	0.5	Off	40874	2618.4	22.81	23.50	1.172	62.9	1.006	0.06	0.405	0.478
	LTE Band 41	QPSK	20M	1	0	Bottom Face	0	On	40340	2565	14.78	15.50	1.180	62.9	1.006	0.06	0.668	0.793
	LTE Band 41	QPSK	20M	1	0	Bottom Face	0	On	41140	2645	14.74	15.50	1.191	62.9	1.006	0.06	0.794	0.952
	LTE Band 41	QPSK	20M	1	0	Bottom Face	0	On	40607	2591.7	14.72	15.50	1.197	62.9	1.006	0.07	0.838	1.009
	LTE Band 41	QPSK	20M	50	0	Bottom Face	0	On	40874	2618.4	14.76	15.50	1.186	62.9	1.006	0.04	0.748	0.892
	LTE Band 41	QPSK	20M	50	0	Edge 3	0	On	40874	2618.4	14.76	15.50	1.186	62.9	1.006	0.03	0.219	0.261
	LTE Band 41	QPSK	20M	50	0	Bottom Face	1.5	Off	40874	2618.4	21.70	22.50	1.202	62.9	1.006	0.02	0.284	0.343
	LTE Band 41	QPSK	20M	50	0	Edge 2	0	Off	40874	2618.4	21.70	22.50	1.202	62.9	1.006	0.06	0.069	0.083
	LTE Band 41	QPSK	20M	50	0	Edge 3	0.5	Off	40874	2618.4	21.70	22.50	1.202	62.9	1.006	0.03	0.309	0.374
	LTE Band 41	QPSK	20M	50	0	Bottom Face	0	On	40340	2565	14.69	15.50	1.205	62.9	1.006	0.07	0.710	0.861
	LTE Band 41	QPSK	20M	50	0	Bottom Face	0	On	41140	2645	14.64	15.50	1.219	62.9	1.006	0.06	0.749	0.919
05	LTE Band 41	QPSK	20M	50	0	Bottom Face	0	On	40607	2591.7	14.62	15.50	1.225	62.9	1.006	0.03	0.820	**1.010**
	LTE Band 41	QPSK	20M	100	0	Bottom Face	0	On	40874	2618.4	14.72	15.50	1.197	62.9	1.006	0.08	0.800	0.963

<DTS WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN 2.4GHz	802.11b 1Mbps	Bottom Face	0	11	2462	9.56	10.00	1.106	0.09	0.385	0.426
	WLAN 2.4GHz	802.11b 1Mbps	Edge 1	0	11	2462	9.56	10.00	1.106	0.03	0.052	0.058
06	WLAN 2.4GHz	802.11g 6Mbps	Bottom Face	0	11	2462	10.48	11.00	1.126	0.16	0.698	**0.786**

<DSS Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
07	Bluetooth v3.0+EDR	1Mbps	Bottom Face	0	00	2402	9.68	10.50	1.208	-0.05	0.625	**0.755**

<NII WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
08	WLAN 5.2GHz	802.11a 6Mbps	Bottom Face	0	48	5240	10.24	11.00	1.192	-0.06	0.633	**0.754**
	WLAN 5.2GHz	802.11a 6Mbps	Edge 1	0	48	5240	10.24	11.00	1.192	0.19	0.328	0.391
09	WLAN 5.3GHz	802.11a 6Mbps	Bottom Face	0	64	5320	10.96	11.50	1.133	-0.08	0.703	**0.796**
	WLAN 5.3GHz	802.11a 6Mbps	Edge 1	0	64	5320	10.96	11.50	1.133	-0.06	0.275	0.312
10	WLAN 5.8GHz	802.11a 6Mbps	Bottom Face	0	161	5805	9.07	9.50	1.104	-0.01	0.932	**1.029**
	WLAN 5.8GHz	802.11a 6Mbps	Edge 1	0	161	5805	9.07	9.50	1.104	-0.19	0.172	0.190
	WLAN 5.8GHz	802.11a 6Mbps	Bottom Face	0	153	5765	8.98	9.50	1.127	0.07	0.634	0.715

15.2 Repeated SAR Measurement

No.	Band	Mode	BW (MHz)	RB Size	RB Offset	Test Position	Gap	Power Back-off	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WCDMA Band II	RMC 12.2Kbps	-	-	-	Edge 2	0	Off	9538	1907.6	22.66	23.00	1.081	-	-	-0.11	1.000	1	1.081
2nd	WCDMA Band II	RMC 12.2Kbps	-	-	-	Edge 2	0	Off	9538	1907.6	22.66	23.00	1.081	-	-	0.13	0.986	1.014	1.066
1st	LTE Band 41	QPSK	20M	1	0	Bottom Face	0	On	40607	2591.7	14.72	15.50	1.197	62.9	1.006	0.07	0.838	1	1.009
2nd	LTE Band 41	QPSK	20M	1	0	Bottom Face	0	On	40607	2591.7	14.72	15.50	1.197	62.9	1.006	0.03	0.827	1.013	0.996
1st	WLAN 5.8GHz	802.11a 6Mbps	-	-	-	Bottom Face	0	-	161	5805	9.07	9.50	1.104	-	-	-0.01	0.932	1	1.029
2nd	WLAN 5.8GHz	802.11a 6Mbps	-	-	-	Bottom Face	0	-	161	5805	9.07	9.50	1.104	-	-	-0.05	0.914	1.019	1.009

General Note:

1. Per KDB 865664 D01v01r03, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg
2. Per KDB 865664 D01v01r03, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

16. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	GPRS/EDGE(data) + WLAN 2.4GHz(data)	Yes
2.	WCDMA(data) + WLAN 2.4GHz(data)	Yes
3.	LTE(data) + WLAN2.4GHz(data)	Yes
4.	GPRS/EDGE(data) + Bluetooth(data)	Yes
5.	WCDMA(data) + Bluetooth(data)	Yes
6.	LTE(data) + Bluetooth(data)	Yes
7.	GPRS/EDGE(data) + WLAN 5GHz(data)	Yes
8.	WCDMA(data) + WLAN 5GHz(data)	Yes
9.	LTE(data) + WLAN5 GHz(data)	Yes

General Note:

1. EUT will choose each GSM, WCDMA and LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
2. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
3. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
4. This device 2.4GHz WLAN supports hotspot operation, 5.8GHz WLAN supports WiFi Direct (GC/GO), and 5.2GHz / 5.3GHz supports WiFi Direct (GC only).
5. The worst case 5 GHz WLAN reported SAR for each configuration was used for SAR summation, therefore, the following summations represent the absolute worst cases for simultaneous transmission with 5 GHz WLAN.
6. For simultaneous transmission analysis for exposure position of bottom face 1.5cm, WLAN/Bluetooth SAR tested at 0mm separation is worse and the test data is used for conservative SAR summation.
7. The reported SAR summation is calculated based on the same configuration and test position.
8. Per KDB 447498 D01v05r02, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*), and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
   v) The SPLSR calculated results please refer to section 16.3.

16.1 Body Exposure Conditions

<WWAN PCB + WLAN DTS>

WWAN Band		Exposure Position	WWAN PCB Max. WWAN SAR (W/kg)	WLAN DTS Max. WLAN SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Bottom Face at 1.5 cm	0.281	0.786	1.07		
		Edge 3 at 0.5 cm	0.284		0.28		
		Bottom Face at 0cm	0.424	0.786	1.21		
		Edge1 at 0cm		0.058	0.06		
		Edge2 at 0cm	0.515		0.52		
		Edge3 at 0cm	0.161		0.16		
	GSM1900	Bottom Face at 1.5 cm	0.421	0.786	1.21		
		Edge 3 at 0.5 cm	0.569		0.57		
		Bottom Face at 0cm	1.007	0.786	**1.79**	**0.01**	**#1**
		Edge1 at 0cm		0.058	0.06		
		Edge2 at 0cm	0.895		0.90		
		Edge3 at 0cm	0.219		0.22		
WCDMA	Band V	Bottom Face at 1.5 cm	0.238	0.786	1.02		
		Edge 3 at 0.5 cm	0.204		0.20		
		Bottom Face at 0cm	0.875	0.786	**1.66**	**0.01**	**#2**
		Edge1 at 0cm		0.058	0.06		
		Edge2 at 0cm	0.461		0.46		
		Edge3 at 0cm	0.240		0.24		
	Band II	Bottom Face at 1.5 cm	0.463	0.786	1.25		
		Edge 3 at 0.5 cm	0.588		0.59		
		Bottom Face at 0cm	0.564	0.786	**1.35**		
		Edge1 at 0cm		0.058	0.06		
		Edge2 at 0cm	1.081		1.08		
		Edge3 at 0cm	0.104		0.10		
LTE	Band 41	Bottom Face at 1.5 cm	0.417	0.786	1.20		
		Edge 3 at 0.5 cm	0.478		0.48		
		Bottom Face at 0cm	1.010	0.786	**1.80**	**0.01**	**#3**
		Edge1 at 0cm		0.058	0.06		
		Edge2 at 0cm	0.086		0.09		
		Edge3 at 0cm	0.266		0.27		

<WWAN PCB + Bluetooth DSS>

WWAN Band		Exposure Position	WWAN PCB Max. WWAN SAR (W/kg)	WLAN DSS Max. WLAN SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Bottom Face at 1.5 cm	0.281	0.755	1.04		
		Edge 3 at 0.5 cm	0.284		0.28		
		Bottom Face at 0cm	0.424	0.755	1.18		
		Edge2 at 0cm	0.515		0.52		
		Edge3 at 0cm	0.161		0.16		
	GSM1900	Bottom Face at 1.5 cm	0.421	0.755	1.18		
		Edge 3 at 0.5 cm	0.569		0.57		
		Bottom Face at 0cm	1.007	0.755	**1.76**	**0.01**	**#4**
		Edge2 at 0cm	0.895		0.90		
		Edge3 at 0cm	0.219		0.22		
WCDMA	Band V	Bottom Face at 1.5 cm	0.238	0.755	0.99		
		Edge 3 at 0.5 cm	0.204		0.20		
		Bottom Face at 0cm	0.875	0.755	**1.63**	**0.01**	**#5**
		Edge2 at 0cm	0.461		0.46		
		Edge3 at 0cm	0.240		0.24		
	Band II	Bottom Face at 1.5 cm	0.463	0.755	1.22		
		Edge 3 at 0.5 cm	0.588		0.59		
		Bottom Face at 0cm	0.564	0.755	**1.32**		
		Edge2 at 0cm	1.081		1.08		
		Edge3 at 0cm	0.104		0.10		
LTE	Band 41	Bottom Face at 1.5 cm	0.417	0.755	1.17		
		Edge 3 at 0.5 cm	0.478		0.48		
		Bottom Face at 0cm	1.010	0.755	**1.77**	**0.01**	**#6**
		Edge2 at 0cm	0.086		0.09		
		Edge3 at 0cm	0.266		0.27		

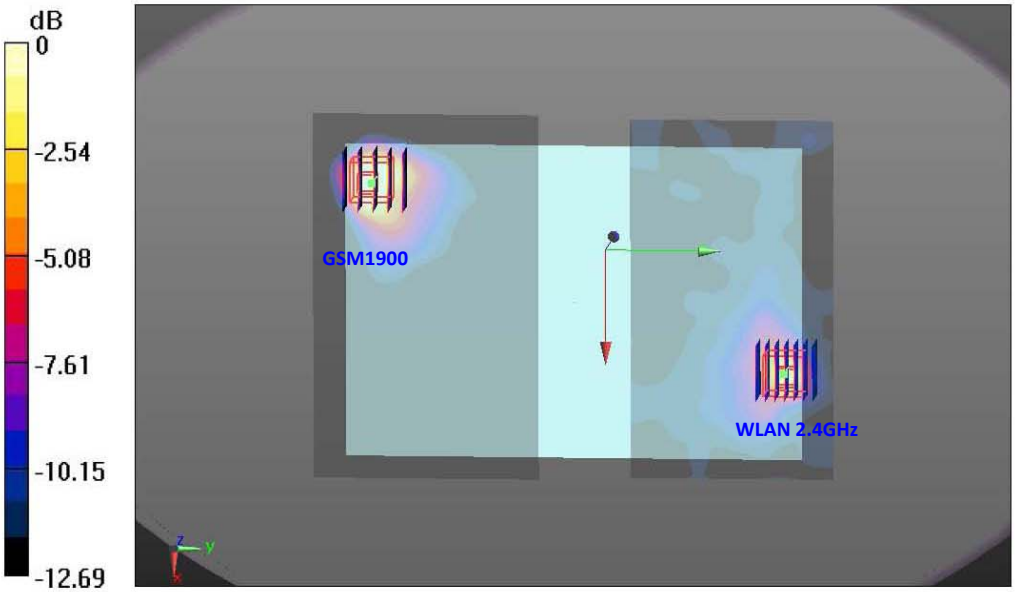
<WWAN PCB + WLAN NII>

WWAN Band		Exposure Position	WWAN PCB Max. WWAN SAR (W/kg)	WLAN DTS Max. WLAN SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Bottom Face at 1.5 cm	0.281	1.029	1.31		
		Edge 3 at 0.5 cm	0.284		0.28		
		Bottom Face at 0cm	0.424	1.029	1.45		
		Edge1 at 0cm		0.391	0.39		
		Edge2 at 0cm	0.515		0.52		
		Edge3 at 0cm	0.161		0.16		
	GSM1900	Bottom Face at 1.5 cm	0.421	1.029	1.45		
		Edge 3 at 0.5 cm	0.569		0.57		
		Bottom Face at 0cm	1.007	1.029	**2.04**	**0.01**	**#7**
		Edge1 at 0cm		0.391	0.39		
		Edge2 at 0cm	0.895		0.90		
		Edge3 at 0cm	0.219		0.22		
WCDMA	Band V	Bottom Face at 1.5 cm	0.238	1.029	1.27		
		Edge 3 at 0.5 cm	0.204		0.20		
		Bottom Face at 0cm	0.875	1.029	**1.90**	**0.01**	**#8**
		Edge1 at 0cm		0.391	0.39		
		Edge2 at 0cm	0.461		0.46		
		Edge3 at 0cm	0.240		0.24		
	Band II	Bottom Face at 1.5 cm	0.463	1.029	1.49		
		Edge 3 at 0.5 cm	0.588		0.59		
		Bottom Face at 0cm	0.564	1.029	**1.59**		
		Edge1 at 0cm		0.391	0.39		
		Edge2 at 0cm	1.081		1.08		
		Edge3 at 0cm	0.104		0.10		
LTE	Band 41	Bottom Face at 1.5 cm	0.417	1.029	1.45		
		Edge 3 at 0.5 cm	0.478		0.48		
		Bottom Face at 0cm	1.010	1.029	**2.04**	**0.01**	**#9**
		Edge1 at 0cm		0.391	0.39		
		Edge2 at 0cm	0.086		0.09		
		Edge3 at 0cm	0.266		0.27		

16.2 SPLSR Evaluation and Analysis

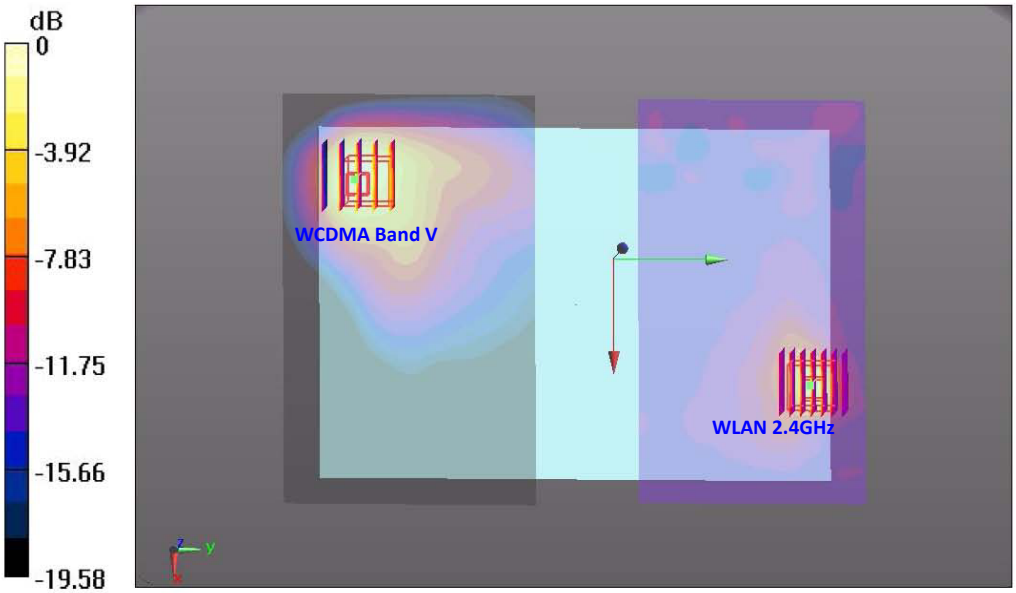
General Note: SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.

Case No #1 Position	Band	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
				X	Y	Z				
Bottom Face	GSM1900	1.007	0	-0.06	-0.109	-0.181	241.5	1.79	0.01	Not required
	WLAN2.4GHz	0.786	0	0.0396	0.111	-0.181				



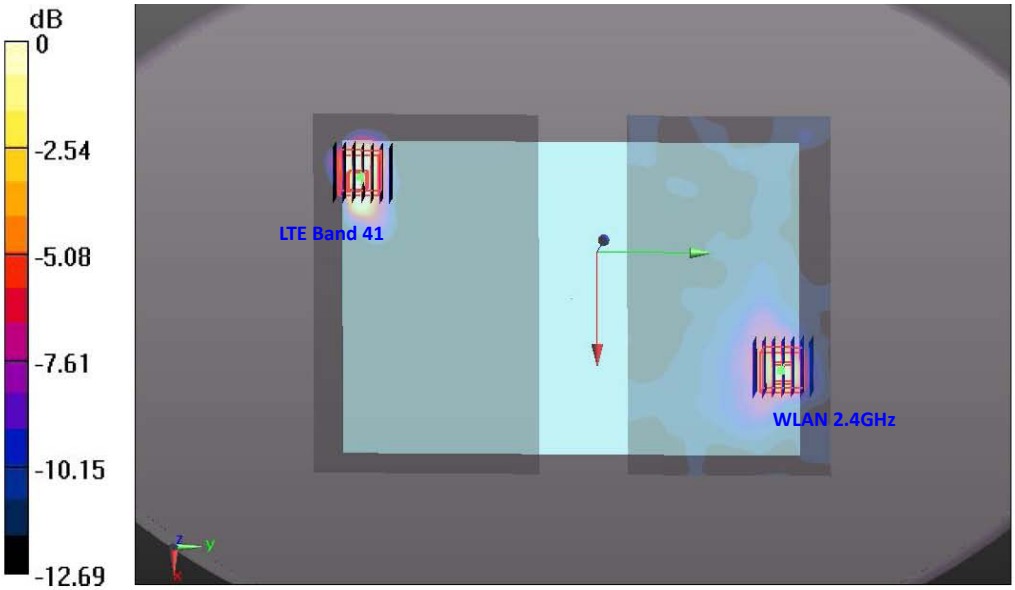
0 dB = 0.768 W/kg

Case No #2 Position	Band	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
				X	Y	Z				
Bottom Face	WCDMA Band V	0.875	0	-0.057	-0.106	-0.182	237.5	1.66	0.01	Not required
	WLAN 2.4GHz	0.786	0	0.0396	0.111	-0.181				



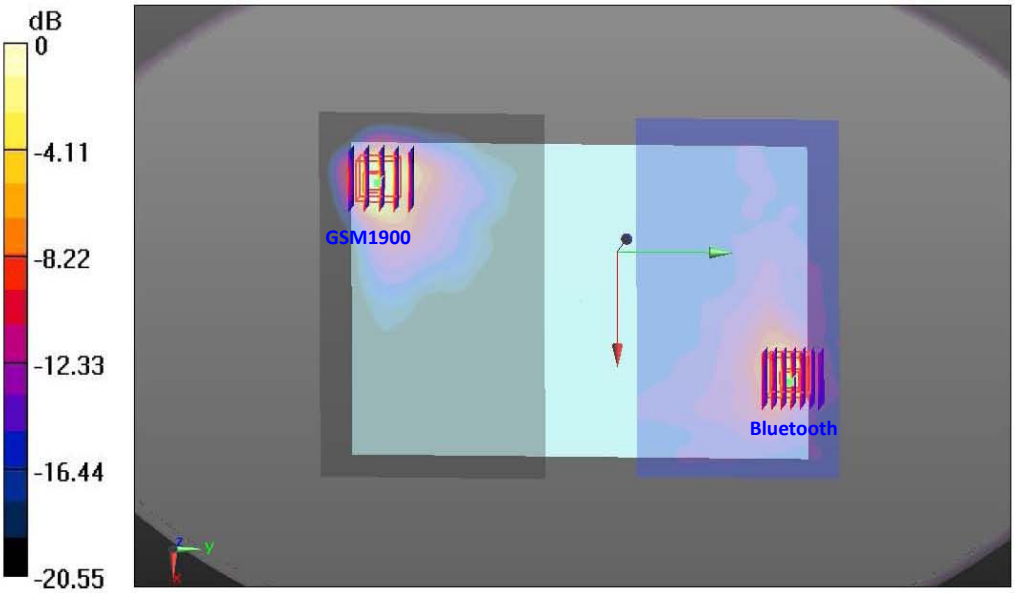
0 dB = 1.09 W/kg

Case No #3 Position	Band	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
				X	Y	Z				
Bottom Face	LTE Band 41	1.010	0	-0.0574	-0.113	-0.181	244.1	1.80	0.01	Not required
	WLAN2.4GHz	0.786	0	0.0396	0.111	-0.181				



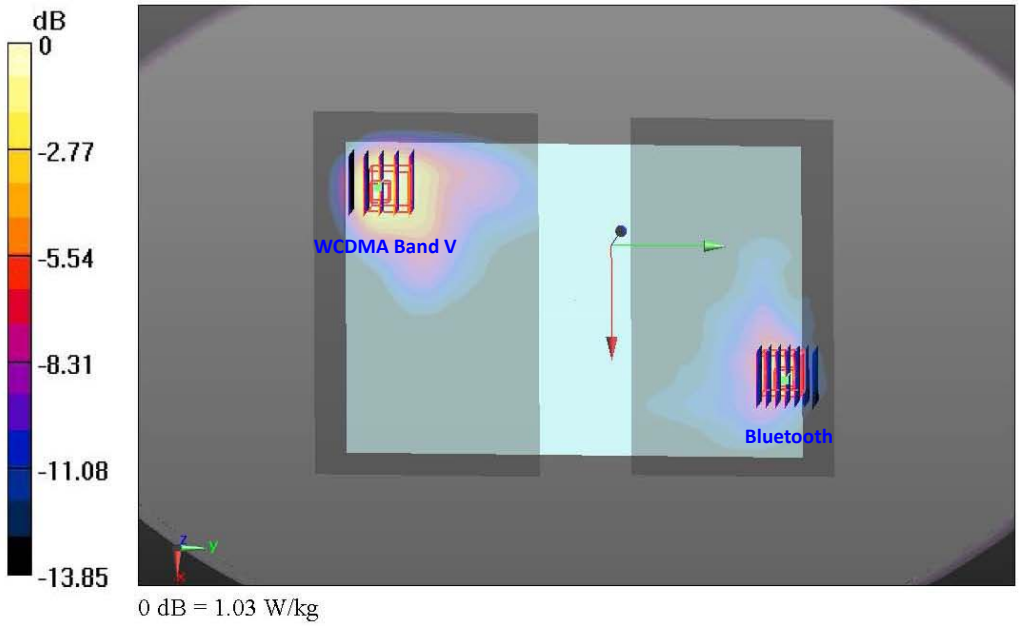
0 dB = 0.768 W/kg

Case No #4 Position	Band	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
				X	Y	Z				
Bottom Face	GSM1900	1.007	0	-0.06	-0.109	-0.181	243.5	1.76	0.01	Not required
	Bluetooth	0.755	0	0.0444	0.111	-0.181				

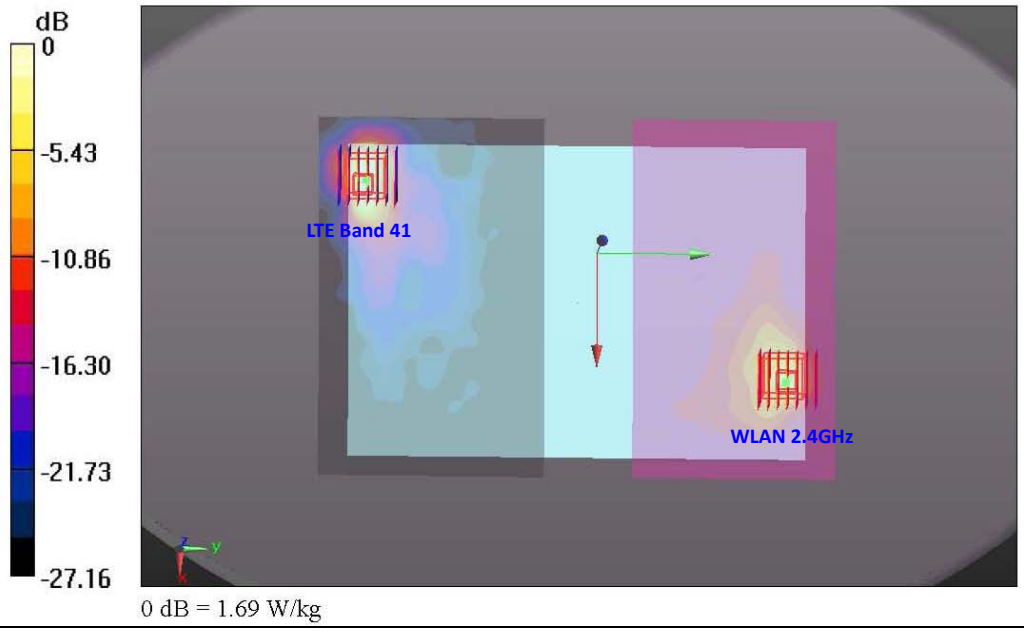


0 dB = 1.55 W/kg

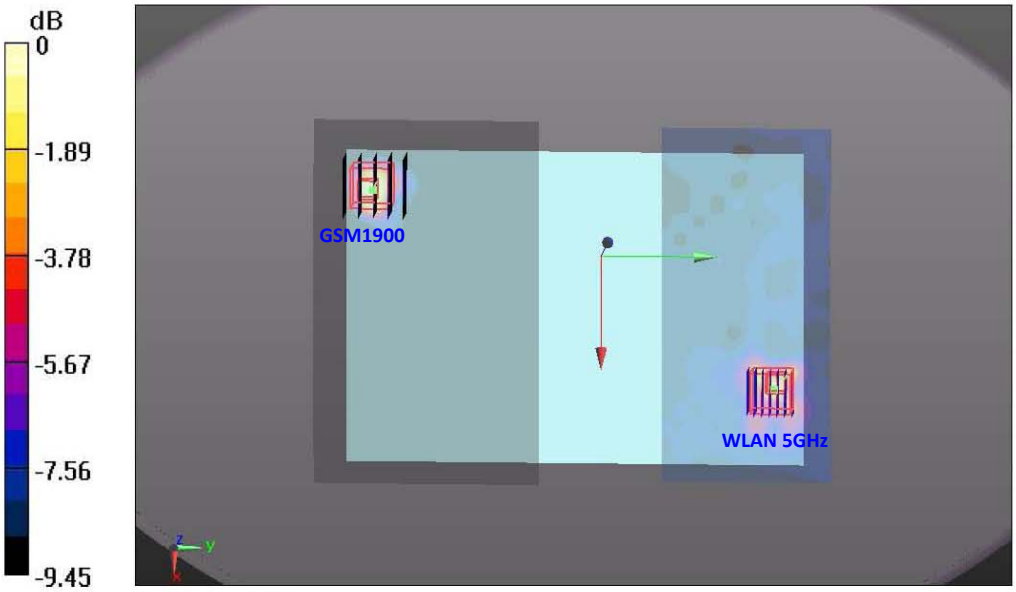
Case No #5 Position	Band	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
				X	Y	Z				
Bottom Face	WCDMA Band V	0.875	0	-0.057	-0.106	-0.182	239.5	1.63	0.01	Not required
	Bluetooth	0.755	0	0.0444	0.111	-0.181				



Case No #6 Position	Band	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
				X	Y	Z				
Bottom Face	LTE Band 41	1.010	0	-0.0574	-0.113	-0.181	246.0	1.77	0.01	Not required
	Bluetooth	0.755	0	0.0444	0.111	-0.181				

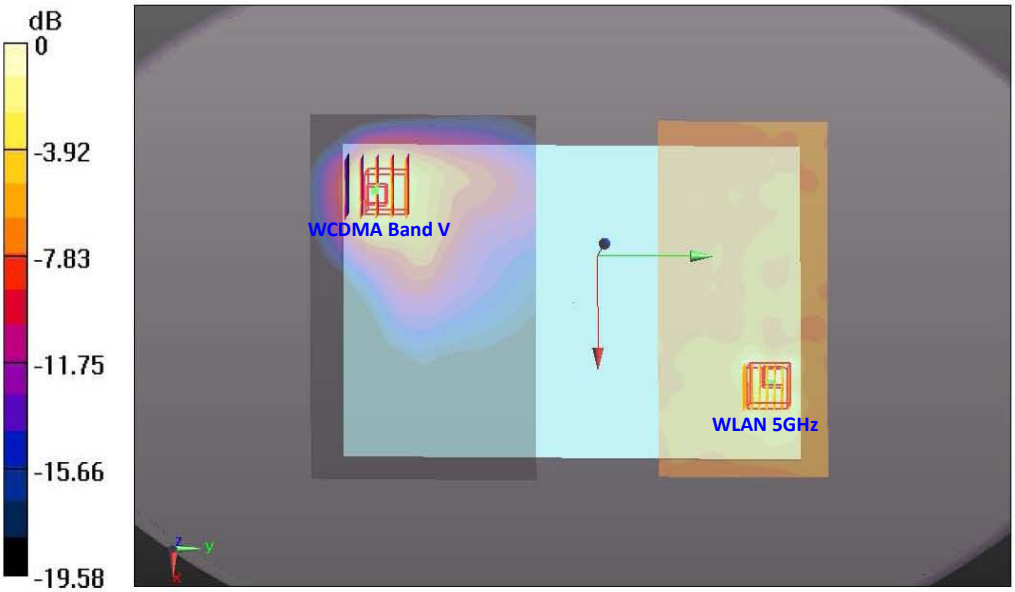


Case No #7 Position	Band	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
				X	Y	Z				
Bottom Face	GSM1900	1.007	0	-0.06	-0.109	-0.181	240.8	2.04	0.01	Not required
	WLAN 5GHz	1.029	0	0.04	0.11	-0.182				



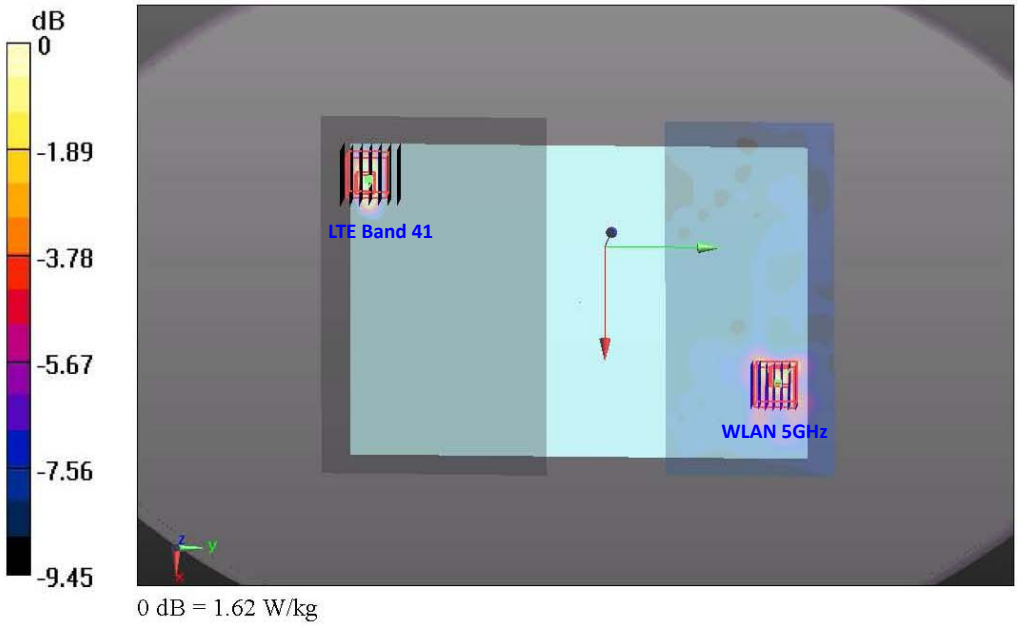
0 dB = 1.62 W/kg

Case No #8 Position	Band	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
				X	Y	Z				
Bottom Face	WCDMA Band V	0.875	0	-0.057	-0.106	-0.182	236.8	1.90	0.01	Not required
	WLAN 5GHz	1.029	0	0.04	0.11	-0.182				



0 dB = 1.09 W/kg

Case No #9 Position	Band	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
				X	Y	Z				
Bottom Face	LTE Band 41	1.010	0	-0.0574	-0.113	-0.181	243.3	2.04	0.01	Not required
	WLAN 5GHz	1.029	0	0.04	0.11	-0.182				



Test Engineer： Luke Lu

17. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	1/k[(b)]	1/√3	1/√6	1/√2

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

Table 17.1 Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.0	Normal	1	1	1	± 6.0 %	± 6.0 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.4	Rectangular	√3	1	1	± 0.2 %	± 0.2 %
Probe Positioning	2.9	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Max. SAR Eval.	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 11.0 %	± 10.8 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						**± 22.0 %**	**± 21.5 %**

Table 17.2 Uncertainty Budget for frequency range 300 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.55	Normal	1	1	1	± 6.55 %	± 6.55 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Probe Positioning	9.9	Rectangular	√3	1	1	± 5.7 %	± 5.7 %
Max. SAR Eval.	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 12.8 %	± 12.6 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						**± 25.6 %**	**± 25.2 %**

Table 17.3 Uncertainty Budget for frequency range 3 GHz to 6 GHz

18. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, December 2003

[4] SPEAG DASY System Handbook

[5] FCC KDB 865664 D01 v01r03, "SAR Measurement Requirements for 100 MHz to 6 GHz", Feb 2014

[6] FCC KDB 865664 D02 v01r01, “RF Exposure Compliance Reporting and Documentation Considerations” May 2013

[7] FCC KDB 447498 D01 v05r02, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Feb 2014

[8] FCC KDB 248227 D01 v01r02, “SAR Measurement Procedures for 802.11 a/b/g Transmitters”, May 2007

[9] FCC KDB 616217 D04 v01r01, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, May 2013

[10] FCC KDB 941225 D01 v03, “3G SAR Measurement Procedures”, Oct 2014

[11] FCC KDB 941225 D05 v02r03, “SAR Evaluation Considerations for LTE Devices”, Dec 2013

Appendix A. Plots of System Performance Check

The plots are shown as follows.

Appendix B. Plots of SAR Measurement

The plots are shown as follows.

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.