FCC SAR TEST REPORT

Report No.:	SET2018-13582
Product:	Industrial tablet
Brand Name:	CHAINWAY
Model No.:	P80
FCC ID:	2AC6AP80
Applicant:	Shenzhen Chainway Information Technology Co.,Ltd.
Address:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an. Shenzhen
Issued by:	CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.
Lab Location:	Building 28/29, East of Shigu Xili Industrial Zone, Nanshan District Shenzhen, Guangdong 518055, China
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Test Report

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Model No. ……..:	P80
Brand Name……..:	CHAINWAY
FCC ID…….:	2AC6AP80
Applicant……..:	Shenzhen Chainway Information Technology Co.,Ltd.
Applicant Address…….:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen
Manufacturer……:	Shenzhen Chainway Information Technology Co.,Ltd.
Manufacturer Address:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen
Test Standards…….:	**47CFR § 2.1093-** Radiofrequency Radiation Exposure Evaluation: Portable Devices; **ANSI C95.1–1992:** Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991) **IEEE 1528–2013:** IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
Test Result……:	Pass
Test Date……:	

Tested by ……..: Mei Chun 2018-11-01

Chun Mei, Test Engineer

Reviewed by……: Chris You 2018-11-01

You Xingjin, Senior Egineer

Approved by……: Zhu Qi 2018-11-01

Zhu Qi , Manager

Contents

1. Administrative Data

1.1 Testing Laboratory

Test Site:	CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd
Address:	Electronic Testing Building, No. 43 Shahe Road, Xili Jiedao, Nanshan District, Shenzhen, Guangdong, China
CNAS Lab Code:	CCIC-SET is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.
NVLAP Lab Code:	CCIC-SET is a third party testing organization accredited by NVLAP according to ISO/IEC 17025. The accreditation certificate number is 201008-0.
FCC Registration:	CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Designation Number: CN5031, valid time is until December 31, 2018.
ISED Registration:	CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until Aug. 03, 2019.
Test Environment Condition:	Temperature (℃): 21℃ Relative Humidity (%): 60% Atmospheric Pressure (kPa): 86KPa-106KPa

2. Equipment Under Test (EUT)

Identification of the Equipment under Test

Device Type:	Portable	
Exposure Category:	Population/Uncontrolled	
Sample Name:	Industrial tablet	
Brand Name:	CHAINWAY	
Model Name:	P80	
General description:	Support Band	GSM850MHz/1900MHz,CDMA BC0 WCDMA 850MHz/1900MHz, LTE Band2/4/7/12/13,WIFI 2.4G, BT,GPS
	Test Band	GPRS850MHz/1900MHz,CDMA BC0 WCDMA 850MHz /1900MHz, LTE Band 2/4/5/7/26/41,WIFI
	IMEI No.	357881013575388
	Device Class	Class B
	Multi Class	GPRS: Class 12; EGPRS: Class 12
	Development Stage	Identical Prototype
	Accessories	Power Supply
	Hotspot	2.4GHz WLAN support Hotspot mode
	Antenna type	Internal Antenna
	Operation mode	GSM /CDMA/WCDMA / LTE /WIFI
	Modulation mode	GSM(GMSK),UMTS(QPSK),LTE(QPSK,16QAM), WIFI(OFDM/DSSS) ,BT(GFSK/π /4-DQPSK/8-DPSK)
	DTM mode	Not support
	Hardware Version	\
	Software Version	\
	Max. RF Power	32.03dBm
	Max. SAR Value	Body: 0.862W/kg(Limit:1.6W/Kg, 0mm distance)

NOTE:

a. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

EUT testing configuration

Tested frequency range(s)	Transmitter Frequency Range	Receiver Frequency Range
GSM850:	824-849 MHz	869-894 MHz
GSM1900:	1850-1910 MHz	1930-1990 MHz
CDMA BC0:	815-849 MHz	860-894 MHz
UMTS Band II:	1850-1910 MHz	1930-1990 MHz
UMTS Band V:	824-849 MHz	869-894 MHz
LTE Band2:	1850-1910 MHz	1930-1990 MHz
LTE Band4:	1710-1755 MHz	2110-2155 MHz
LTE Band5:	824-849 MHz	869-894 MHz
LTE Band7:	2500-2570 MHz	2620-2690 MHz
LTE Band26:	810-850 MHz	
LTE Band41	2498-2688 MHz	
WIFI(tested):	2412-2462 MHz	
	5180-5240 MHz	
Bluetooth:	2402-2480 MHz	
NFC:	13.56MHz	
Test channels(low-mid-high):	128-190-251(GSM850)	
	512-661-810(GSM1900)	
	9262-9400-9538(UMTS Band II)	
	4132-4183-4233(UMTS Band V)	
	1024-234-799(CDMA BC0)	
	18700-18900-19100(LTE Band 2 Bandwidth 20M)	
	20050-20175-20300(LTE Band 4 Bandwidth 20M)	
	20450-20525-20600(LTE Band 5 Bandwidth 10M)	
	20850-21100-21350(LTE Band 7 Bandwidth 20M)	
	26775-26865-26965(LTE Band 26 Bandwidth 15M)	
	39750-40620-41490(LTE Band 41 Bandwidth 20M)	
	1-6-11(Wife 2.4G 802.11b)	
	5180(Wife 2.4G 802.11a)	

3. SAR Summary

Highest Standalone SAR Summary

Exposure Position	Frequency Band	Scaled 1g-SAR(W/kg)	Highest Scaled 1g-SAR(W/kg)
Body-worn Accessory (0mm Gap)	GSM850	0.862	0.862
	GSM1900	0.817	
	CDMA BC0	0.774	
	WCDMA Band V	0.061	
	WCDMA Band II	0.393	
	LTE Band 2	0.364	
	LTE Band 4	0.279	
	LTE Band 5	0.095	
	LTE Band 7	0.350	
	LTE Band 26	0.140	
	LTE Band 41	0.605	
	WIFI 2.4G 802.11b	0.496	
	WIFI 5G 802.11a	0.688	

Highest Simultaneous SAR Summary

Exposure Position	Frequency Band	Highest Scaled 1g-SAR(W/kg)
Hotspot (0mmGap)	WWAN(GSM850)&WIFI	1.542

4. Specific Absorption Rate (SAR)

4.1 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.

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 (). The equation description is as below:

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

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

SAR measurement can be either related to the temperature elevation in tissue by

$$SAR = C\frac{\delta T}{\delta t}$$

where C is the specific head capacity, δT is the temperature rise and δt the exposure duration, or related to the electrical field in the tissue by

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

where σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the rms electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

4.2 Applicable Standards and Limits

4.2.1 Applicable Standards

47CFR § 2.1093	Radiofrequency Radiation Exposure Evaluation: Portable Devices
ANSI C95.1–1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991)
IEEE 1528–2013	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB 248227 D01	v02r02 802.11 Wi-Fi SAR
KDB 447498 D01	v06 General RF Exposure Guidance
KDB 616217 D04	v01r02 SAR for laptop and tablets
KDB 648474 D04	v01r03 Handset SAR
KDB 865664 D01	v01r04 SAR Measurement 100MHz to 6GHz
KDB 865664 D02	v01r02 SAR Exposure Reporting
KDB 941225 D01	v03r01 3G SAR Procedures
KDB 941225 D05	v02r05 SAR for LTE Devices
KDB 941225 D06	v02r01 Hotspot Mode

4.2.2 RF exposure Limits

Human Exposure	**Uncontrolled Environment General Population**
Spatial Peak SAR* (Brain/Body)	**1.60 mW/g**
Spatial Average SAR** (Whole Body)	0.08 mW/g
Spatial Peak SAR*** (Limbs)	4.00 mW/g

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

Notes:

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

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

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

4.3 Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SATIMO. The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region, where shell thickness increases to 6mm).

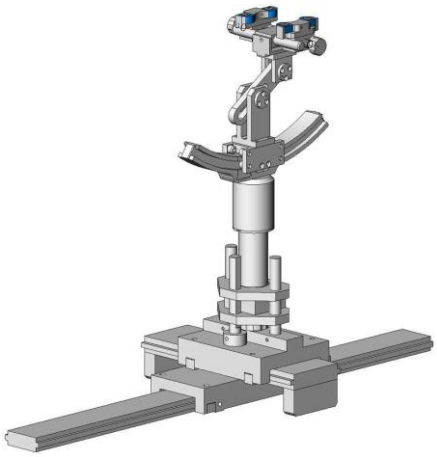
System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.

SAM Twin Phantom

4.4 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SATIMO as an integral part of the COMOSAR test system.

The device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.



Device holder

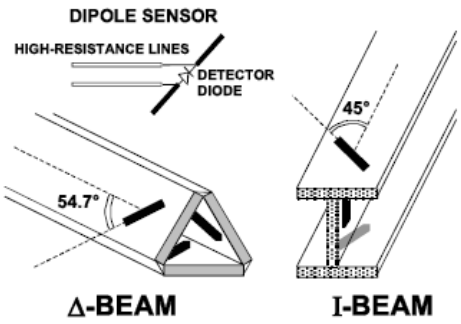
4.5 Probe Specification

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	700 MHz to 3 GHz; Linearity: ± 0.5 dB (700 MHz to 3 GHz)
Directivity	± 0.25 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	1.5 µW/g to 100 mW/g; Linearity: ± 0.5 dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 5 mm Distance from probe tip to dipole centers: <2.7 mm
Application	General dosimetry up to 3 GHz Dosimetry in strong gradient fields Compliance tests of P80 LTE USB Modems
Compatibility	COMOSAR

Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



5. Tissue check and recommend Dielectric Parameters

5.1 Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness Power drifts in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

Table 1: Recommended Dielectric Performance of Tissue

Ingredients (% by weight)	Frequency (MHz)											
	450		835		915		1900		2450		2600	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.46	52.4	41.05	56.0	54.9	40.4	62.7	73.2	55.24	64.49
Salt (Nacl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04	0.5	0.024
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0	0.0	0.0
Triton x-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0	44.45	32.25
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.2	52.5	39.0	52.5
Conductivity (s/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.80	1.78	1.96	2.16

MSL/HSL750 (Body and Head liquid for 650 – 850 MHz)

Item	Head Tissue Simulation Liquid HSL750 Muscle(body)Tissue Simulation Liquid MSL750			
H2O	Water, 35 – 58%			
Sucrese	Sugar, white, refined, 40-60%			
NaCl	Sodium Chloride, 0-6%			
Hydroxyethel-cellulsoe	Medium Viscosity (CAS# 9004-62-0), <0.3%			
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone, 0.1-0.7%			
Frequency (MHz)	Head εr	Head σ(S/m)	Body εr	Bodyσ(S/m)
750	41.9	0.89	55.2	0.97

Note: The liquid of 700MHz&2600MHz typical liquid composition is provided by SATIMO.

Table 2 Recommended Tissue Dielectric Parameters

Frequency (MHz)	Head Tissue		Body Tissue	
	ε_r	σ(S/m)	ε_r	σ(S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

5.2 Simulate liquid

Liquid check results:

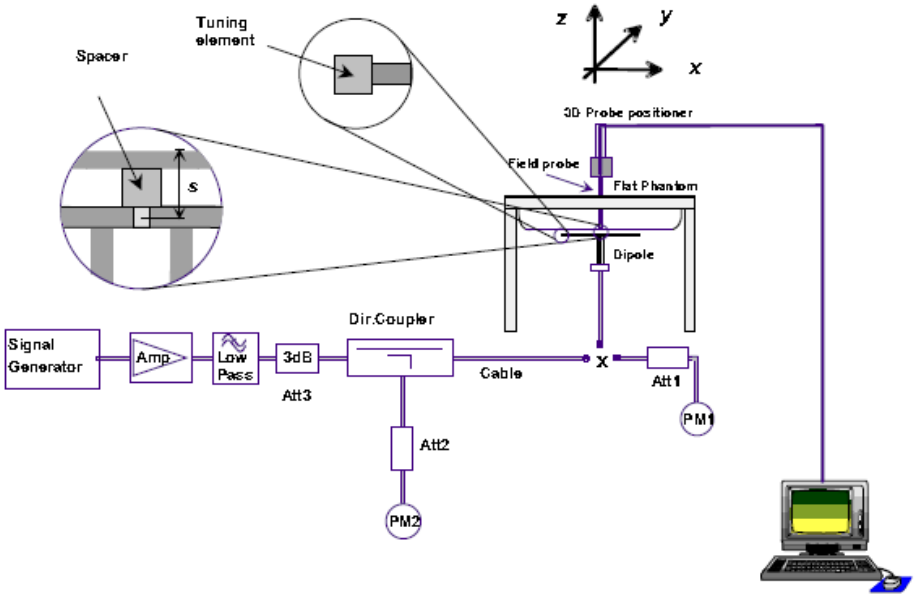
Table 3: Dielectric Performance of Body Tissue Simulating Liquid

Temperature: 23.2°C; Humidity: 64%;			
/	Frequency	Permittivity ε	Conductivity σ (S/m)
Target value	850MHz	55.2±5%	0.97±5%
Validation value (2018-10-27)	850MHz	55.02	0.97
Target value	1900MHz	53.3±5%	1.52±5%
Validation value (2018-10-28)	1900MHz	53.23	1.51
Target value	2450MHz	52.7±5%	1.95±5%
Validation value (2018-10-29)	2450MHz	52.88	1.93
Target value	2600MHz	52.5±5%	2.16±5%
Validation value (2018-10-30)	2600MHz	52.45	2.11
Target value	5200MHz	49±5%	5.3±5%
Validation value (2018-10-31)	5200MHz	49.45	5.21

SAR System validation

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

The following procedure, recommended for performing validation tests using box phantoms is based on the procedures described in the IEEE standard P1528. Setup according to the setup diagram below:



With the SG and Amp and with directional coupler in place, set up the source signal at the relevant frequency and use a power meter to measure the power at the end of the SMA cable that you intend to connect to the balanced dipole. Adjust the SG to make this, say, 0.01W (10 dBm). If this level is too high to read directly with the power meter sensor, insert a calibrated attenuator (e.g. 10 or 20 dB) and make a suitable correction to the power meter reading.

Note 1: In this method, the directional coupler is used for monitoring rather than setting the exact feed power level. If, however, the directional coupler is used for power measurement, you should check the frequency range and power rating of the coupler and measure the coupling factor (referred to output) at the test frequency using a VNA.

Note 2: Remember that the use of a 3dB attenuator (as shown in Figure 8.1 of P1528) means that you need an RF amplifier of 2 times greater power for the same feed power. The other issue is the cable length. You might get up to 1dB of loss per meter of cable, so the cable length after the coupler needs to be quite short.

Note 3: For the validation testing done using CW signals, most power meters are suitable. However, if you are measuring the output of a modulated signal from either a signal generator or a handset, you must ensure that the power meter correctly reads the modulated signals.

The measured 1-gram averaged SAR values of the device against the phantom are provided in Tables 5 and Table 6. The humidity and ambient temperature of test facility

were 64% and 23.2°C respectively. The body phantom were full of the body tissue simulating liquid. The EUT was supplied with full-charged battery for each measurement.

The distance between the back of the EUT and the bottom of the flat phantom is 10 mm (taking into account of the IEEE 1528 and the place of the antenna).

Table 4: Body SAR system validation (1g)

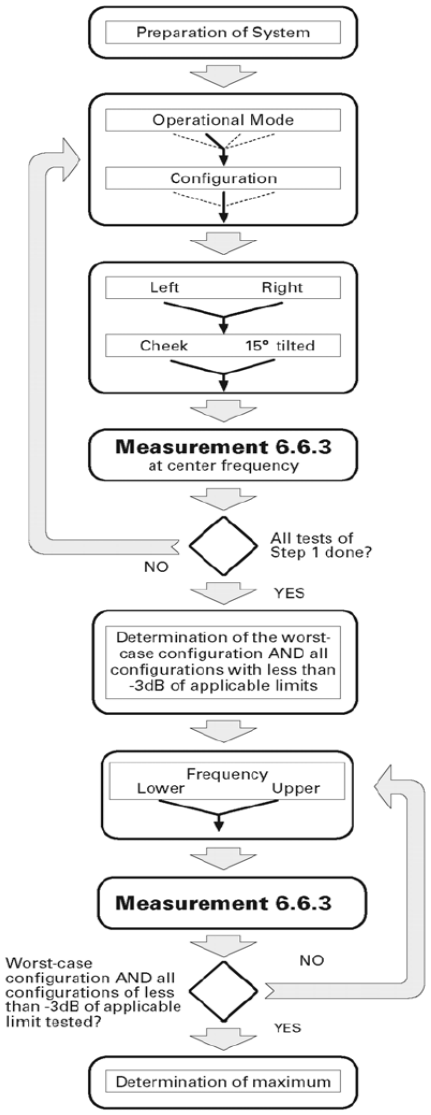
Frequency	Duty cycle	Target value （W/kg）	Test value (W/kg)	
			10 mW	1W
835MHz(2018-10-27)	1:1	10.31±10%	0.1021	10.21
1900MHz(2018-10-28)	1:1	40.81±10%	0.4071	40.71
2450MHz(2018-10-29)	1:1	51.42±10%	0.5161	51.61
2600MHz(2018-10-30)	1:1	57.55±10%	0.5641	56.41
5200MHz(2018-10-31)	1:1	155.78±10%	1.5551	155.51

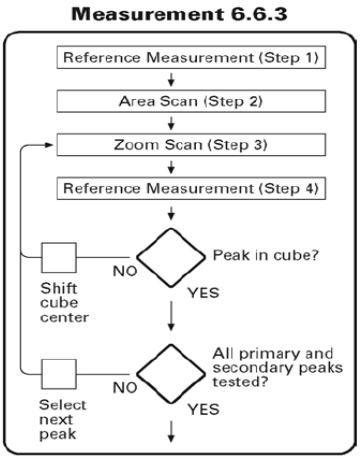
* Note: Target value was referring to the measured value in the calibration certificate of reference dipole.

Note: All SAR values are normalized to 1W forward power.

6. SAR measurement procedure

The SAR test against the head phantom was carried out as follow:





Establish a call with the maximum output power with a base station simulator, the connection between the EUT and the base station simulator is established via air interface.

After an area scan has been done at a fixed distance of 2mm from the surface of the phantom on the source side, a 3D scan is set up around the location of the maximum spot SAR. First, a point within the scan area is visited by the probe and a SAR reading taken at the start of testing. At the end of testing, the probe is returned to the same point and a second reading is taken. Comparison between these start and end readings enables the power drift during measurement to be assessed.

Above is the scanning procedure flow chart and table from the IEEEp1528 standard. This is the procedure for which all compliant testing should be carried out to ensure that all variations of the device position and transmission behavior are tested.

7. Conducted RF Output Power

8.1 GSM Conducted Power

GSM850		Burst-Averaged output Power (dBm)			Division Factors	Frame-Averaged output Power (dBm)		
		128CH	190CH	251CH		128CH	190CH	251CH
GSM (CS)		31.49	32.03	31.98	-9.03	22.46	23.00	22.95
GPRS (GMSK)	1 Tx Slot	30.25	30.48	30.96	-9.03	21.22	21.45	21.93
	2 Tx Slots	27.66	27.75	27.88	-6.02	21.64	21.73	21.86
	3 Tx Slots	26.05	26.14	26.23	-4.26	21.79	21.88	21.97
	4 Tx Slots	24.86	24.90	24.99	-3.01	21.85	21.89	21.98
EDGE (8PSK)	1 Tx Slot	25.36	25.47	24.87	-9.03	16.33	16.44	15.84
	2 Tx Slots	23.57	23.68	23.35	-6.02	17.55	17.66	17.33
	3 Tx Slots	22.14	22.26	22.03	-4.26	17.88	18.00	17.77
	4 Tx Slots	20.65	20.76	20.55	-3.01	17.64	17.75	17.54
GSM1900		Burst-Averaged output Power (dBm)			Division Factors	Frame-Averaged output Power (dBm)		
		512CH	661CH	810CH		512CH	661CH	810CH
GSM (CS)		29.38	29.67	29.36	-9.03	20.35	20.64	20.33
GPRS (GMSK)	1 Tx Slot	28.36	28.97	29.07	-9.03	19.33	19.94	20.04
	2 Tx Slots	25.87	26.12	26.18	-6.02	19.85	20.10	20.16
	3 Tx Slots	24.05	24.26	24.04	-4.26	19.79	20.00	19.78
	4 Tx Slots	23.36	23.66	23.35	-3.01	20.35	20.65	20.34
EDGE (8PSK)	1 Tx Slot	25.05	25.47	25.60	-9.03	16.02	16.44	16.57
	2 Tx Slots	23.25	23.58	23.37	-6.02	17.23	17.56	17.35
	3 Tx Slots	22.01	22.17	22.00	-4.26	17.75	17.91	17.74
	4 Tx Slots	20.84	20.96	20.83	-3.01	17.83	17.95	17.82

Note: Per KDB 447498 D01 v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.

For hotspot SAR, EUT was performed at GPRS Class 12 multi-slots(4TX) mode

For Head and Body-worn SAR testing, EUT was set in GSM Voice mode for both GSM850 and GSM1900

Timeslot consignations

No. Of Slots	Slot 1	Slot 2	Slot 3	Slot 4
Slot Consignation	1Up4Down	2UpDown	3UpDown	4Up1Down
Duty Cycle	1:8	1:4	1:2.67	1:2
Crest Factor	-9.03dB	-6.02dB	-4.26dB	-3.01dB

8.2 CDMA Conducted output Power

Conducted Power (Unit:dBm)			
Band	CDMA2000 BC0		
Channel	1013	384	777
Frequency(MHz)	824.7	836.52	848.31
1xRTT RC1 + SO55	23.35	23.47	23.48
1xRTT RC3 + SO55	23.26	23.39	23.27
1xRTT RC3 + SO32(+ F-SCH)	23.24	23.19	23.26
1xRTT RC3 + SO32(+SCH)	23.31	23.32	23.27
1xEVDO Rev A RETAP	22.76	22.65	22.49

8.3 WCDMA Conducted output Power

Item	band	WCDMA 850			WCDMA 1900		
	Frequency	4132	4183	4233	9262	9400	9538
	Subtest	dBm			dBm		
WCDMA	RMC 12.2Kbps	22.02	22.77	22.88	22.09	22.66	22.74
HSDPA	1	22.01	22.63	22.72	22.05	22.45	22.54
	2	21.85	21.84	21.85	21.89	21.86	21.83
	3	21.52	21.53	21.54	21.53	21.42	21.47
	4	21.12	21.24	21.35	21.33	21.24	21.34
HSUPA	1	21.89	22.47	22.56	22.03	21.78	21.53
	2	21.62	21.64	21.62	21.57	21.63	21.42
	3	21.42	21.36	21.54	21.43	21.42	21.32
	4	21.33	21.30	21.36	21.25	21.26	21.23
	5	21.25	21.26	21.32	21.16	21.23	21.17

Note:

1. WCDMA SAR was tested under PMC 12.2kbps with HSPA Inactive per KDB Publication 941225 D01v03r01.HSPA SAR was not requires since the average output power of the HSPA subtests was not more than 0.25dB higher than the RMC level and SAR was less than 1.2W/kg.

2. It is expected by the manufacturer that MPR for some HSPA subtests may be up to 2dB more than specified by 3GPP, but also as low as 0dB according to the chipset implementation in this model

8.3 LTE Conducted peak output Power

LTE Test Configurations

The CMW500 Wide Band Radio Communication Tester was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR test were performed with the same number of RB and RB offsets transmitting on all frames.

1) Spectrum Plots for RB configurations

A properly configured base station simulator was used for LTE output power measurements and SAR testing. Therefore, spectrum plots for RB configurations were not required to be included in this report.

2) MPR

When MPR is implemented permanently within the UE, regardless of network requirements, only those RB configurations allowed by 3GPP for the channel bandwidth and modulation combinations may be tested with MPR active. Configurations with RB allocations less than the RB thresholds required by 3GPP must be tested without MPR.

The allowed Maximum Power Reduction(MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101:

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth configuration [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

3)A-MPR LTE procedures for SAR testing

A-MPR(Additional MPR) has been disabled for all SAR tests by using Network Signaling Value of “NS_01” on the base station simulator.

4)LTE procedures for SAR testing

A) Largest channel bandwidth standalone SAR test

requirements i) QPSK with 1 RB allocation

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. When the reported SAR is ≤ 0.8W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel.

When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

1. LTE Band 2 Conducted Power Test Verdict:

LTE FDD Band 2				Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel 18607	Channel 18900	Channel 19193
1.4MHz	QPSK	1	0	21.25	21.36	21.42
		1	3	21.12	21.26	21.3
		1	5	21.14	21.25	21.29
		3	0	20.42	20.54	20.57
		3	2	20.43	20.53	20.54
		3	3	20.44	20.55	20.55
		6	0	20.3	20.42	20.44
	16QAM	1	0	20.12	20.21	20.31
		1	3	19.97	20.1	20.18
		1	5	20.1	20.18	20.3
		3	0	19.19	19.29	19.49
		3	2	19.27	19.39	19.52
		3	3	19.29	19.4	19.46
		6	0	19.17	19.3	19.31
Bandwidth	Modulation	RB size	RB offset	Channel 18615	Channel 18900	Channel 19185
3MHz	QPSK	1	0	21.58	21.89	21.71
		1	7	21.45	21.79	21.59
		1	14	21.47	21.78	21.58
		8	0	20.75	21.07	20.86
		8	4	20.76	21.06	20.83
		8	7	20.77	21.08	20.84
		15	0	20.63	20.95	20.73
	16QAM	1	0	20.45	20.74	20.6
		1	7	20.3	20.63	20.47
		1	14	20.43	20.71	20.59
		8	0	19.52	19.82	19.78
		8	4	19.6	19.92	19.81
		8	7	19.62	19.93	19.75
		15	0	19.5	19.83	19.6
Bandwidth	Modulation	RB size	RB offset	Channel 18625	Channel 18900	Channel 19175
5MHz	QPSK	1	0	22.02	21.85	21.76
		1	13	21.89	21.75	21.64

		1	24	21.91	21.74	21.63
		12	0	21.19	21.03	20.91
		12	6	21.2	21.02	20.88
		12	13	21.21	21.04	20.89
		25	0	21.07	20.91	20.78
	16QAM	1	0	20.89	20.7	20.65
		1	13	20.74	20.59	20.52
		1	24	20.87	20.67	20.64
		12	0	19.96	19.78	19.83
		12	6	20.04	19.88	19.86
		12	13	20.06	19.89	19.8
		25	0	19.94	19.79	19.65
Bandwidth	Modulation	RB size	RB offset	Channel 18650	Channel 18900	Channel 19150
10MHz	QPSK	1	0	21.88	22.04	22.15
		1	25	21.75	21.94	22.03
		1	49	21.77	21.93	22.02
		25	0	21.05	21.22	21.3
		25	13	21.06	21.21	21.27
		25	25	21.07	21.23	21.28
		50	0	20.93	21.1	21.17
	16QAM	1	0	20.75	20.89	21.04
		1	25	20.6	20.78	20.91
		1	49	20.73	20.86	21.03
		25	0	19.82	19.97	20.22
		25	13	19.9	20.07	20.25
		25	25	19.92	20.08	20.19
		50	0	19.8	19.98	20.04
Bandwidth	Modulation	RB size	RB offset	Channel 18675	Channel 18900	Channel 19125
15MHz	QPSK	1	0	22.23	22.35	22.28
		1	38	22.1	22.25	22.16
		1	74	22.12	22.24	22.15
		36	0	21.4	21.53	21.43
		36	18	21.41	21.52	21.4
		36	39	21.42	21.54	21.41
		75	0	21.28	21.41	21.3
	16QAM	1	0	21.1	21.2	21.17
		1	38	20.95	21.09	21.04
		1	74	21.08	21.17	21.16
		36	0	20.17	20.28	20.35
		36	18	20.25	20.38	20.38
		36	39	20.27	20.39	20.32

		75	0	20.15	20.29	20.17
Bandwidth	Modulation	RB size	RB offset	Channel 18700	Channel 18900	Channel 19100
20MHz	QPSK	1	0	22.45	22.67	22.36
		1	50	22.32	22.57	22.24
		1	99	22.34	22.56	22.23
		50	0	21.62	21.85	21.51
		50	25	21.63	21.84	21.48
		50	50	21.64	21.86	21.49
		100	0	21.5	21.73	21.38
	16QAM	1	0	21.32	21.52	21.25
		1	50	21.17	21.41	21.12
		1	99	21.3	21.49	21.24
		50	0	20.39	20.6	20.43
		50	25	20.47	20.7	20.46
		50	50	20.49	20.71	20.4
		100	0	20.37	20.61	20.25

2. LTE Band 4 Conducted Power Test Verdict:

LTE FDD Band 4				**Conducted Power(dBm)**		
Bandwidth	Modulation	RB size	RB offset	Channel 19957	Channel 20175	Channel 20393
1.4MHz	QPSK	1	0	21.33	21.41	21.52
		1	3	21.2	21.31	21.4
		1	5	21.22	21.3	21.39
		3	0	20.5	20.59	20.67
		3	2	20.51	20.58	20.64
		3	3	20.52	20.6	20.65
		6	0	20.38	20.47	20.54
	16QAM	1	0	20.2	20.26	20.41
		1	3	20.05	20.15	20.28
		1	5	20.18	20.23	20.4
		3	0	19.27	19.34	19.59
		3	2	19.35	19.44	19.62
		3	3	19.37	19.45	19.56
		6	0	19.25	19.35	19.41
Bandwidth	Modulation	RB size	RB offset	Channel 19965	Channel 20175	Channel 20385
3MHz	QPSK	1	0	21.55	21.83	21.77
		1	7	21.42	21.73	21.65
		1	14	21.44	21.72	21.64

		8	0	20.72	21.01	20.92
		8	4	20.73	21	20.89
		8	7	20.74	21.02	20.9
		15	0	20.6	20.89	20.79
	16QAM	1	0	20.42	20.68	20.66
		1	7	20.27	20.57	20.53
		1	14	20.4	20.65	20.65
		8	0	19.49	19.76	19.84
		8	4	19.57	19.86	19.87
		8	7	19.59	19.87	19.81
		15	0	19.47	19.77	19.66
Bandwidth	Modulation	RB size	RB offset	Channel 19975	Channel 20175	Channel 20375
5MHz	QPSK	1	0	21.89	21.91	21.86
		1	13	21.76	21.81	21.74
		1	24	21.78	21.8	21.73
		12	0	21.06	21.09	21.01
		12	6	21.07	21.08	20.98
		12	13	21.08	21.1	20.99
		25	0	20.94	20.97	20.88
	16QAM	1	0	20.76	20.76	20.75
		1	13	20.61	20.65	20.62
		1	24	20.74	20.73	20.74
		12	0	19.83	19.84	19.93
		12	6	19.91	19.94	19.96
		12	13	19.93	19.95	19.9
		25	0	19.81	19.85	19.75
Bandwidth	Modulation	RB size	RB offset	Channel 20000	Channel 20175	Channel 20350
10MHz	QPSK	1	0	22.26	22.31	22.48
		1	25	22.13	22.21	22.36
		1	49	22.15	22.2	22.35
		25	0	21.43	21.49	21.63
		25	13	21.44	21.48	21.6
		25	25	21.45	21.5	21.61
		50	0	21.31	21.37	21.5
	16QAM	1	0	21.13	21.16	21.37
		1	25	20.98	21.05	21.24
		1	49	21.11	21.13	21.36
		25	0	20.2	20.24	20.55
		25	13	20.28	20.34	20.58
		25	25	20.3	20.35	20.52
		50	0	20.18	20.25	20.37

Bandwidth	Modulation	RB size	RB offset	Channel 20025	Channel 20175	Channel 20325
15MHz	QPSK	1	0	22.61	22.39	22.54
		1	38	22.48	22.29	22.42
		1	74	22.5	22.28	22.41
		36	0	21.78	21.57	21.69
		36	18	21.79	21.56	21.66
		36	39	21.8	21.58	21.67
		75	0	21.66	21.45	21.56
	16QAM	1	0	21.48	21.24	21.43
		1	38	21.33	21.13	21.3
		1	74	21.46	21.21	21.42
		36	0	20.55	20.32	20.61
		36	18	20.63	20.42	20.64
		36	39	20.65	20.43	20.58
		75	0	20.53	20.33	20.43
Bandwidth	Modulation	RB size	RB offset	Channel 20050	Channel 20175	Channel 20300
20MHz	QPSK	1	0	22.65	22.74	22.56
		1	50	22.52	22.64	22.44
		1	99	22.54	22.63	22.43
		50	0	21.82	21.92	21.71
		50	25	21.83	21.91	21.68
		50	50	21.84	21.93	21.69
		100	0	21.7	21.8	21.58
	16QAM	1	0	21.52	21.59	21.45
		1	50	21.37	21.48	21.32
		1	99	21.5	21.56	21.44
		50	0	20.59	20.67	20.63
		50	25	20.67	20.77	20.66
		50	50	20.69	20.78	20.6
		100	0	20.57	20.68	20.45

3. LTE Band 5 Conducted Power Test Verdict:

LTE FDD Band 5				Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel 20407	Channel 20525	Channel 20643
1.4MHz	QPSK	1	0	22.15	22.23	22.31
		1	3	22.02	22.12	22.2
		1	5	22	22.08	22.17
		3	0	21.34	21.37	21.45
		3	2	21.3	21.4	21.49
		3	3	21.31	21.39	21.44
		6	0	21.16	21.2	21.34
	16QAM	1	0	21.02	21.11	21.16
		1	3	20.91	20.96	21.05
		1	5	21	21.07	21.14
		3	0	20.11	20.19	20.33
		3	2	20.14	20.28	20.39
		3	3	20.2	20.3	20.3
		6	0	20.06	20.12	20.09
Bandwidth	Modulation	RB size	RB offset	Channel 20415	Channel 20525	Channel 20635
3MHz	QPSK	1	0	22.48	22.59	22.55
		1	7	22.33	22.45	22.41
		1	14	22.37	22.46	22.4
		8	0	21.66	21.74	21.72
		8	4	21.67	21.77	21.74
		8	7	21.68	21.75	21.67
		15	0	21.5	21.62	21.56
	16QAM	1	0	21.36	21.46	21.38
		1	7	21.21	21.31	21.23
		1	14	21.33	21.4	21.35
		8	0	20.44	20.52	20.57
		8	4	20.5	20.64	20.66
		8	7	20.55	20.62	20.55
		15	0	20.4	20.46	20.31
Bandwidth	Modulation	RB size	RB offset	Channel 20425	Channel 20525	Channel 20625
5MHz	QPSK	1	0	22.65	22.58	22.71
		1	13	22.5	22.43	22.6
		1	24	22.52	22.46	22.56
		12	0	21.83	21.75	21.9
		12	6	21.84	21.74	21.87
		12	13	21.82	21.71	21.86

		25	0	21.68	21.59	21.713
	16QAM	1	0	21.51	21.46	21.55
		1	13	21.38	21.32	21.41
		1	24	21.46	21.44	21.48
		12	0	20.57	20.54	20.7
		12	6	20.7	20.6	20.83
		12	13	20.69	20.63	20.69
		25	0	20.54	20.52	20.45
Bandwidth	Modulation	RB size	RB offset	Channel 20450	Channel 20525	Channel 20600
10MHz	QPSK	1	0	22.85	22.97	22.71
		1	25	22.67	22.85	22.56
		1	49	22.69	22.85	22.6
		25	0	22.04	22.14	21.88
		25	13	22	22.13	21.89
		25	25	22.02	22.16	21.9
		50	0	21.91	22.01	21.7
	16QAM	1	0	21.72	21.82	21.56
		1	25	21.61	21.71	21.45
		1	49	21.67	21.74	21.53
		25	0	20.81	20.88	20.72
		25	13	20.86	20.93	20.8
		25	25	20.87	20.96	20.68
		50	0	20.74	20.79	20.46

4. LTE Band 7 Conducted Power Test Verdict:

LTE FDD Band 7				**Conducted Power(dBm)**		
Bandwidth	Modulation	RB size	RB offset	Channel 20775	Channel 21100	Channel 21425
5MHz	QPSK	1	0	20.85	20.71	20.79
		1	13	20.74	20.56	20.64
		1	24	20.72	20.58	20.68
		12	0	19.97	19.86	19.96
		12	6	20	19.9	19.93
		12	13	20.02	19.88	19.94
		25	0	19.86	19.68	19.85
	16QAM	1	0	19.74	19.59	19.63
		1	13	19.62	19.46	19.52
		1	24	19.69	19.54	19.62
		12	0	18.83	18.61	18.78
		12	6	18.86	18.75	18.87
		12	13	18.88	18.7	18.8

		25	0	18.77	18.55	18.68
Bandwidth	Modulation	RB size	RB offset	Channel 20800	Channel 21100	Channel 21400
10MHz	QPSK	1	0	21.01	21.03	20.95
		1	25	20.9	20.88	20.8
		1	49	20.88	20.9	20.84
		25	0	20.13	20.18	20.12
		25	13	20.16	20.22	20.09
		25	25	20.18	20.2	20.1
		50	0	20.02	20	20.01
	16QAM	1	0	19.9	19.91	19.79
		1	25	19.78	19.78	19.68
		1	49	19.85	19.86	19.78
		25	0	18.99	18.93	18.94
		25	13	19.02	19.07	19.03
		25	25	19.04	19.02	18.96
		50	0	18.93	18.87	18.84
Bandwidth	Modulation	RB size	RB offset	Channel 20825	Channel 21100	Channel 21375
15MHz	QPSK	1	0	21.05	21.08	21.11
		1	38	20.94	20.93	20.96
		1	74	20.92	20.95	21
		36	0	20.17	20.23	20.28
		36	18	20.2	20.27	20.25
		36	39	20.22	20.25	20.26
		75	0	20.06	20.05	20.17
	16QAM	1	0	19.94	19.96	19.95
		1	38	19.82	19.83	19.84
		1	74	19.89	19.91	19.94
		36	0	19.03	18.98	19.1
		36	18	19.06	19.12	19.19
		36	39	19.08	19.07	19.12
		75	0	18.97	18.92	19
Bandwidth	Modulation	RB size	RB offset	Channel 20850	Channel 21100	Channel 21350
20MHz	QPSK	1	0	21.25	21.33	21.18
		1	50	21.14	21.18	21.03
		1	99	21.12	21.2	21.07
		50	0	20.37	20.48	20.35
		50	25	20.4	20.52	20.32
		50	50	20.42	20.5	20.33
		100	0	20.26	20.3	20.24
	16QAM	1	0	20.14	20.21	20.02

		1	50	20.02	20.08	19.91
		1	99	20.09	20.16	20.01
		50	0	19.23	19.23	19.17
		50	25	19.26	19.37	19.26
		50	50	19.28	19.32	19.19
		100	0	19.17	19.17	19.07

5. LTE Band 26 Conducted Power Test Verdict:

LTE FDD Band 26				Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel 26697	Channel 26865	Channel 27033
1.4MHz	QPSK	1	0	22.11	22.25	22.03
		1	3	21.98	22.15	21.91
		1	5	22	22.14	21.9
		3	0	21.28	21.43	21.18
		3	2	21.29	21.42	21.15
		3	3	21.3	21.44	21.16
		6	0	21.16	21.31	21.05
	16QAM	1	0	20.98	21.1	20.92
		1	3	20.83	20.99	20.79
		1	5	20.96	21.07	20.91
		3	0	20.05	20.18	20.1
		3	2	20.13	20.28	20.13
		3	3	20.15	20.29	20.07
		6	0	20.03	20.19	19.92
Bandwidth	Modulation	RB size	RB offset	Channel 26705	Channel 26865	Channel 27025
3MHz	QPSK	1	0	22.29	22.31	22.26
		1	7	22.16	22.21	22.14
		1	14	22.18	22.2	22.13
		8	0	21.46	21.49	21.41
		8	4	21.47	21.48	21.38
		8	7	21.48	21.5	21.39
		15	0	21.34	21.37	21.28
	16QAM	1	0	21.16	21.16	21.15
		1	7	21.01	21.05	21.02
		1	14	21.14	21.13	21.14
		8	0	20.23	20.24	20.33
		8	4	20.31	20.34	20.36
		8	7	20.33	20.35	20.3
		15	0	20.21	20.25	20.15
Bandwidth	Modulation	RB	RB	Channel	Channel	Channel

		size	offset	26715	26865	27015
5MHz	QPSK	1	0	22.15	22.38	22.23
		1	13	22.02	22.28	22.11
		1	24	22.04	22.27	22.1
		12	0	21.32	21.56	21.38
		12	6	21.33	21.55	21.35
		12	13	21.34	21.57	21.36
		25	0	21.2	21.44	21.25
	16QAM	1	0	21.02	21.23	21.12
		1	13	20.87	21.12	20.99
		1	24	21	21.2	21.11
		12	0	20.09	20.31	20.3
		12	6	20.17	20.41	20.33
		12	13	20.19	20.42	20.27
		25	0	20.07	20.32	20.12
Bandwidth	Modulation	RB size	RB offset	Channel 26740	Channel 26865	Channel 26990
10MHz	QPSK	1	0	22.39	22.51	22.41
		1	25	22.26	22.41	22.29
		1	49	22.28	22.4	22.28
		25	0	21.56	21.69	21.56
		25	13	21.57	21.68	21.53
		25	25	21.58	21.7	21.54
		50	0	21.44	21.57	21.43
	16QAM	1	0	21.26	21.36	21.3
		1	25	21.11	21.25	21.17
		1	49	21.24	21.33	21.29
		25	0	20.33	20.44	20.48
		25	13	20.41	20.54	20.51
		25	25	20.43	20.55	20.45
		50	0	20.31	20.45	20.3
Bandwidth	Modulation	RB size	RB offset	Channel 26765	Channel 26865	Channel 26965
15MHz	QPSK	1	0	22.43	22.57	22.39
		1	38	22.3	22.47	22.27
		1	74	22.32	22.46	22.26
		36	0	21.6	21.75	21.54
		36	18	21.61	21.74	21.51
		36	39	21.62	21.76	21.52
		75	0	21.48	21.63	21.41
	16QAM	1	0	21.3	21.42	21.28
		1	38	21.15	21.31	21.15
		1	74	21.28	21.39	21.27

		36	0	20.37	20.5	20.46
		36	18	20.45	20.6	20.49
		36	39	20.47	20.61	20.43
		75	0	20.35	20.51	20.28

6. LTE Band 41 Conducted Power Test Verdict

LTE TDD Band 41				Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel 39675	Channel 40620	Channel 41565
5MHz	QPSK	1	0	20.56	20.85	20.79
		1	13	20.41	20.73	20.68
		1	24	20.37	20.7	20.67
		12	0	19.71	19.99	19.96
		12	6	19.65	19.98	19.84
		12	13	19.63	19.99	19.84
		25	0	19.58	19.81	19.83
	16QAM	1	0	19.41	19.71	19.65
		1	13	19.23	19.6	19.5
		1	24	19.37	19.66	19.57
		12	0	18.45	18.78	18.82
		12	6	18.56	18.72	18.94
		12	13	18.58	18.73	18.8
		25	0	18.44	17.93	18.51
Bandwidth	Modulation	RB size	RB offset	Channel 39700	Channel 40620	Channel 41540
10MHz	QPSK	1	0	20.81	20.95	20.88
		1	25	20.66	20.83	20.77
		1	49	20.62	20.8	20.76
		25	0	19.96	20.09	20.05
		25	13	19.9	20.08	19.93
		25	25	19.88	20.09	19.93
		50	0	19.83	19.91	19.92
	16QAM	1	0	19.66	19.81	19.74
		1	25	19.48	19.7	19.59
		1	49	19.62	19.76	19.66
		25	0	18.7	18.88	18.91
		25	13	18.81	18.82	19.03
		25	25	18.83	18.83	18.89
		50	0	18.69	18.03	18.6
Bandwidth	Modulation	RB size	RB offset	Channel 39725	Channel 40620	Channel 41515
15MHz	QPSK	1	0	21.05	21.11	21.08

		1	38	20.9	20.99	20.97
		1	74	20.86	20.96	20.96
		36	0	20.2	20.25	20.25
		36	18	20.14	20.24	20.13
		36	39	20.12	20.25	20.13
		75	0	20.07	20.07	20.12
	16QAM	1	0	19.9	19.97	19.94
		1	38	19.72	19.86	19.79
		1	74	19.86	19.92	19.86
		36	0	18.94	19.04	19.11
		36	18	19.05	18.98	19.23
		36	39	19.07	18.99	19.09
		75	0	18.93	18.19	18.8
Bandwidth	Modulation	RB size	RB offset	Channel 39750	Channel 40620	Channel 41490
20MHz	QPSK	1	0	21.22	21.29	21.26
		1	50	21.07	21.17	21.15
		1	99	21.03	21.14	21.14
		50	0	20.37	20.43	20.43
		50	25	20.31	20.42	20.31
		50	50	20.29	20.43	20.31
		100	0	20.24	20.25	20.3
	16QAM	1	0	20.07	20.15	20.12
		1	50	19.89	20.04	19.97
		1	99	20.03	20.1	20.04
		50	0	19.11	19.22	19.29
		50	25	19.22	19.16	19.41
		50	50	19.24	19.17	19.27
		100	0	19.1	18.37	18.98

8.4 WLAN 2.4GHz Band Conducted Power

Channel/Freq.(MHz)	Maximum Conducted Out Power (dBm) Average		
	802.11b	802.11g	802.11n(HT20)
1(2412)	16.59	16.54	15.78
6(2437)	17.06	17.12	16.15
11(2462)	18.48	18.05	17.06

Channel/Freq.(MHz)	Maximum Conducted Out Power (dBm) Average
	802.11n40
3(2422)	15.40
6(2437)	15.09
9(2452)	15.41

WLAN 5GHz Band Conducted Power

U-NII-1 AVGSA Output Power		
Mode	Test Frequency (MHz)	Max Conducted Output Power (dBm)
802.11n (20MHz)	5180	14.12
802.11n (20MHz)	5220	14.05
802.11n (20MHz)	5240	14.14
802.11n (40MHz)	5190	15.19
802.11n (40MHz)	5230	14.88
802.11a (20MHz)	5180	14.34
802.11a (20MHz)	5220	14.13
802.11a (20MHz)	5240	14.08

Note:

1. Per KDB248227 D01 v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at lowest data rate
3. Per KDB248227 D01 v02r02, 802.11g /11n-HT20/11n-HT40 is not required. . When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤1.2W/Kg. Thus the SAR can be excluded.

8.5 Bluetooth Output Power

Channel	Frequency (MHz)	BT3.0 Output Power(dBm) Average		
		GFSK	π /4-DQPSK	8-DPSK
CH 0	2402	7.46	7.52	8.23
CH 39	2441	7.81	8.29	8.53
CH 78	2480	8.66	9.24	9.46

Channel	Frequency (MHz)	BT4.0 Output Power(dBm)Peak
		GFSK
CH 0	2402	-0.155
CH 20	2442	0.016
CH 39	2480	-0.241

8.7 NFC Output Power

Frequency (MHz)	Output Power(dBμV/m)
13.56	38.063

8. SAR test Exclusion and estimate SAR calculation:

Note:

1. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100MHz to 6GHz at test separation distances ≤ 50mm are determined by:[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [$\sqrt{f}$ (GHz)] ≤3.0 for 1-g SAR and ≤7.5 for 10-g extremity SAR
   (1) f(GHz) is the RF channel transmit frequency in GHz
   (2) Power and distance are round to the nearest mW and mm before calculation
   (3) The result is rounded to one decimal place for comparison
   (4) If the test separation distance(antenna-user) is < 5mm, 5mm is used for excluded SAR calculation
   (5)

BT3.0 Max Power (dBm)	mW	Test Distance (mm)	Frequency(GHz)	Exclusion Thresholds
9.5	8.913	5	2.45	2.790

Per KDB 447498 D01v06 exclusion thresholds is2.790<3, RF exposure evaluation is not required.

BT estimated SAR value=Exclusion Thresholds/7.5=2.790/7.5=**0.372W/Kg**

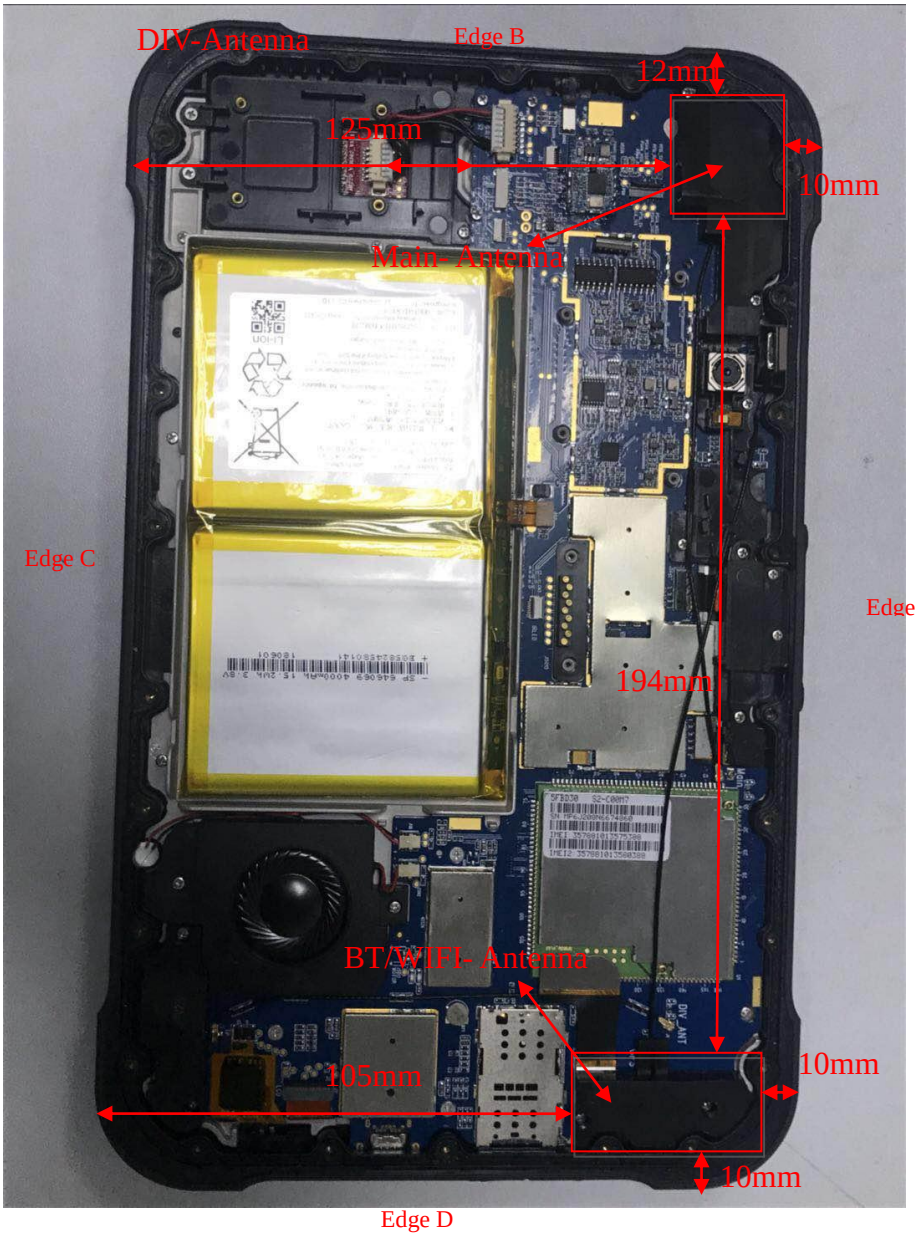
BT4.0 Max Power (dBm)	mW	Test Distance (mm)	Frequency(GHz)	Exclusion Thresholds
0.5	1.122	5	2.45	0.351

Per KDB 447498 D01v06 exclusion thresholds is0.351<3, RF exposure evaluation is not required.

BT estimated SAR value=Exclusion Thresholds/7.5=0.351/7.5=**0.047**W/Kg

The estimated SAR value is used for simultaneous transmission analysis.

Antenna Location:



Antenna-to-User (Edge Side) distance (mm):

Antenna	Front	Back	Edge A	Edge B	Edge C	Edge D
WWAN Main Antenna	12	4	10	12	125	194
WIFI Antenna	12	4	10	149	105	10

Note: The diagonal distance of the overall section is 15cm.

The Body SAR measurement positions of each band are as below:

Antenna	Front	Back	Edge A	Edge B	Edge C	Edge D
WWAN Antenna Body-worn	Yes	Yes	No	No	No	No
WWAN Antenna hotspot	Yes	Yes	No	Yes	Yes	Yes
WIFI Antenna Body-worn	Yes	Yes	No	No	No	No
WIFI Antenna hotspot	Yes	Yes	Yes	No	No	Yes

Note: According to KDB 941225 D06 v02r01, when antenna-to-edge>2.5cm, SAR is not required.

9. Scaling Factor calculation

Operation Mode	Channel	Output Power(dBm)	Tune up Power in tolerance(dBm)	Scaling Factor
GPRS850(GPRS) 4Tx	128	24.86	24.5 ± 1.0	1.159
	190	24.90	24.5 ± 1.0	1.148
	251	24.99	24.5 ± 1.0	1.125
GPRS1900(GPRS) 4Tx	512	23.36	23.0 ± 1.0	1.159
	661	23.66	23.0 ± 1.0	1.081
	810	23.35	23.0 ± 1.0	1.161
CDMA (1XEVDO Rel.0)	1013	23.35	23.0±1.0	1.161
	384	23.47	23.0±1.0	1.130
	777	23.48	23.0±1.0	1.127
WCDMA850	4132	22.02	22.0 ± 1.0	1.253
	4183	22.77	22.0 ± 1.0	1.054
	4233	22.88	22.0 ± 1.0	1.028
WCDMA1900	9262	22.09	22.0 ± 1.0	1.233
	9400	22.66	22.0 ± 1.0	1.081
	9538	22.74	22.0 ± 1.0	1.062
LTE B2 20MHz 1RB#0	18700	22.45	22.0 ± 1.0	1.135
	18900	22.67	22.0 ± 1.0	1.079
	19100	22.36	22.0 ± 1.0	1.159
LTE B2 20MHz 50RB#0	18700	21.62	21.0 ± 1.0	1.091
	18900	21.85	21.0 ± 1.0	1.035
	19100	21.51	21.0 ± 1.0	1.119
LTE B4 20MHz 1RB#0	20050	22.65	22.0 ± 1.0	1.084
	20175	22.74	22.0 ± 1.0	1.062
	20300	22.56	22.0 ± 1.0	1.107
LTE B4 20MHz 50RB#0	20050	21.82	21.0 ± 1.0	1.042
	20175	21.92	21.0 ± 1.0	1.019
	20300	21.71	21.0 ± 1.0	1.069
LTE B5 10MHz 1RB#0	20450	22.85	22.0 ± 1.0	1.035
	20525	22.97	22.0 ± 1.0	1.007
	20600	22.71	22.0 ± 1.0	1.069
LTE B5 10MHz 25RB#0	20450	22.04	21.5 ± 1.0	1.112
	20525	22.14	21.5 ± 1.0	1.086
	20600	21.88	21.5 ± 1.0	1.153
LTE B7 20MHz 1RB#0	20850	21.25	20.5 ± 1.0	1.059
	21100	21.33	20.5 ± 1.0	1.040
	21350	21.18	20.5 ± 1.0	1.076
LTE B7 20MHz 50RB#0	20850	20.37	19.5 ± 1.0	1.030
	21100	20.48	19.5 ± 1.0	1.005
	21350	20.35	19.5 ± 1.0	1.035

LTE B26 15MHz 1RB#0	26775	22.43	22.0 ± 1.0	1.140
	26865	22.57	22.0 ± 1.0	1.104
	26965	22.39	22.0 ± 1.0	1.151
LTE B26 15MHz 36RB#0	26775	21.60	21.0 ± 1.0	1.096
	26865	21.75	21.0 ± 1.0	1.059
	26965	21.54	21.0 ± 1.0	1.112
LTE B41 20MHz 50RB#0	39750	21.22	20.5 ± 1.0	1.067
	40620	21.29	20.5 ± 1.0	1.050
	41490	21.26	20.5 ± 1.0	1.057
LTE B41 20MHz 50RB#0	39750	21.37	20.5 ± 1.0	1.030
	40620	20.43	20.5 ± 1.0	1.279
	41490	20.43	20.5 ± 1.0	1.279
WIFI 802.11b	1	16.59	17.5 ± 1.0	1.552
	6	17.06	17.5 ± 1.0	1.393
	11	18.48	17.5 ± 1.0	1.005
WIFI 802.11a	5180	14.12	13.5 ± 1.0	1.091
BT	20	0.016	8.5 ± 1.0	1.118

Note: for LTE power tolerance, only QPSK modulation mode was provide here.

10. Test Results

Table 1: SAR Values of GSM 850MHz Band

Temperature: 23.0~23.5°C, humidity: 62~64%.							
Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR (W/Kg),1g	Scaled Factor	Scaled SAR (W/Kg),1g	Power drift (%)	
Body-worn (0mm Separation) GPRS (4Tx)	Face Upward	124/824.2	0.719	1.159	0.833	-0.32	--
		190/836.6	0.744	1.148	0.854	1.25	--
		251/848.8	0.733	1.125	0.825	1.34	--
	Face Upward repeated	124/824.2	0.717	1.159	0.831	2.44	--
		190/836.6	0.742	1.148	0.852	0.53	--
		251/848.8	0.732	1.125	0.824	2.10	--
	Back Upward	124/824.2	0.723	1.159	0.838	0.23	--
		190/836.6	**0.751**	1.148	**0.862**	**-0.75**	**1**
		251/848.8	0.739	1.125	0.831	1.23	--
	Back Upward repeated	124/824.2	0.718	1.159	0.832	-3.42	--
		190/836.6	0.743	1.148	0.853	1.28	--
		251/848.8	0.732	1.125	0.824	1.01	--
	Edge A	190/836.6	0.346	1.148	0.397	3.25	--
	Edge B	190/836.6	0.359	1.148	0.412	1.55	--

Table 2: SAR Values of GSM1900 MHz Band

Temperature: 23.0~23.5°C, humidity: 62~64%.								
Test Positions			Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
				SAR (W/Kg), 1g	Scaled Factor	Scaled SAR (W/Kg),1g	Power drift (%)	
Hotspot (0mm Separation)	GPRS (4Tx)	Face Upward	512/1850.2	0.699	1.159	0.810	-1.36	--
			661/1880.0	0.701	1.081	0.758	-2.33	--
			810/1909.8	**0.704**	1.161	**0.817**	-1.12	2
		Face Upward repeated	512/1850.2	0.694	1.159	0.804	0.45	--
			661/1880.0	0.700	1.081	0.757	2.30	--
			810/1909.8	0.702	1.161	0.815	2.11	--
		Back Upward	512/1850.2	0.654	1.159	0.758	1.23	--
			661/1880.0	0.629	1.081	0.680	-2.35	--
			810/1909.8	0.685	1.161	0.795	4.12	--
		Edge A	661/1880.0	0.572	1.081	0.618	2.69	--
		Edge B	661/1880.0	0.182	1.081	0.197	3.49	--

Table 3: SAR Values of WCDMA850

Temperature: 23.0~23.5°C, humidity: 62~64%.							
Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR (W/Kg), 1g	Scaled Factor	Scaled SAR (W/Kg),1g	Power drift (%)	
Hotspot (0mm Separation)	Face Upward	4183/836.6	0.065	1.054	0.069	1.36	--
	Back Upwlard	4132/826.4	0.054	1.253	0.068	2.23	
		4183/836.6	**0.068**	1.054	**0.072**	-1.18	**3**
		4233/846.6	0.061	1.028	0.063	0.21	**--**
	Edge A	4183/836.6	0.058	1.054	0.061	1.01	**--**
	Edge B	4183/836.6	0.043	1.054	0.045	-1.33	**--**

Table 4: SAR Values of WCDMA1900

Temperature: 23.0~23.5°C, humidity: 62~64%.							
Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR (W/Kg),1g	Scaled Factor	Scaled SAR (W/Kg),1g	Power drift (%)	
Hotspot (0mm Separation)	Face Upward	9400/1880	0.193	1.081	0.209	1.33	--
	Back Upward	9262/1852.4	0.291	1.233	0.359	2.36	**--**
		9400/1880	**0.364**	1.081	**0.393**	-1.73	**4**
		9538/1907.6	0.325	1.062	0.345	3.69	**--**
	Edge A	9400/1880	0.158	1.081	0.171	-4.25	--
	Edge B	9400/1880	0.265	1.081	0.286	4.35	--

Table 5: SAR Values of LTE Band 2,10MHz, QPSK

Temperature: 23.0~23.5°C, humidity: 62~64%.							
Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR (W/Kg),1g	Scaled Factor	Scaled SAR (W/Kg),1g	Power drift (%)	
1RB #0							
Body (0mm Separation) Hotspot	Face Upward	18700/1860	0.301	1.135	0.342	-1.33	--
		18900/1880	**0.337**	1.079	**0.364**	-1.59	**5**
		19100/1900	0.305	1.159	0.353	1.23	--
	Back Upward	18900/1880	0.231	1.079	0.249	0.33	**--**
	Edge A	18900/1880	0.200	1.079	0.216	1.58	**--**
	Edge B	18900/1880	0.058	1.079	0.063	-2.22	**--**
50%RB #0							
Body (0mm Separation) Hotspot	Face Upward	18900/1880	0.285	1.035	0.295	1.23	--
	Back Upward	18900/1880	0.211	1.035	0.218	3.32	--
	Edge A	18900/1880	0.185	1.035	0.191	1.35	--
	Edge B	18900/1880	0.043	1.035	0.045	1.32	--

Table 6: SAR Values of LTE Band 4, 20MHz, QPSK

Temperature: 23.0~23.5°C, humidity: 62~64%.							
Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR (W/Kg),1g	Scaled Factor	Scaled SAR (W/Kg),1g	Power drift (%)	
1RB #0							
Body (0mm Separation) Hotspot	Face Upward	20050/1732.5	0.245	1.084	0.266	1.23	**--**
		20175/1732.5	**0.263**	1.062	**0.279**	-0.20	**6**
		20300/1745	0.251	1.107	0.278	0.33	**--**
	Back Upward	20175/1732.5	0.234	1.062	0.249	0.39	**--**
	Edge A	20175/1732.5	0.185	1.062	0.196	0.42	--
	Edge B	20175/1732.5	0.155	1.062	0.165	1.58	**--**
50%RB #0							
Body (0mm Separation) Hotspot	Face Upward	20175/1732.5	0.231	1.019	0.235	1.31	--
	Back Upward	20175/1732.5	0.187	1.019	0.191	2.36	--
	Edge A	20175/1732.5	0.156	1.019	0.159	-4.21	--
	Edge B	20175/1732.5	0.111	1.019	0.113	3.35	--

Table 7: SAR Values of LTE Band 5,10MHz, QPSK

Temperature: 23.0~23.5°C, humidity: 62~64%.							
Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR (W/Kg),1g	Scaled Factor	Scaled SAR(W/Kg),1g	Power drift (%)	
1RB #0							
Body (0mm Separation) Hotspot	Face Upward	20525/836.5	0.076	1.007	0.077	2.25	**--**
	Back Upward	20450/829	0.091	1.035	0.094	1.33	
		20525/836.5	**0.094**	1.007	**0.095**	-1.47	**7**
		20600/844	0.085	1.069	0.091	2.36	**--**
	Edge A	20525/836.5	0.036	1.007	0.036	4.12	**--**
	Edge B	20525/836.5	0.061	1.007	0.061	3.46	**--**
50%RB #0							
Body (0mm Separation) Hotspot	Face Upward	20525/836.5	0.061	1.086	0.066	-2.25	--
	Back Upward	20525/836.5	0.074	1.086	0.080	-2.36	--
	Edge A	20525/836.5	0.025	1.086	0.027	2.14	--
	Edge B	20525/836.5	0.056	1.086	0.061	1.25	--

Table 8: SAR Values of LTE Band 7,20MHz, QPSK

Temperature: 23.0~23.5°C, humidity: 62~64%.							
Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR (W/Kg),1g	Scaled Factor	Scaled SAR(W/Kg),1g	Power drift (%)	
1RB #0							
Body (0mm Separation) Hotspot	Face Upward	21100/2535	0.253	1.040	0.263	1.25	--
	Back Upward	20850/2510	0.315	1.059	0.334	0.36	--
		21100/2535	**0.337**	1.040	**0.350**	1.27	**8**
		21350/2560	0.301	1.079	0.325	0.31	--
	Edge A	21100/2535	0.258	1.040	0.268	3.25	--
	Edge B	21100/2535	0.037	1.040	0.038	4.11	--
50%RB #0							
Body (0mm Separation) Hotspot	Face Upward	21100/2535	0.234	1.005	0.235	1.25	--
	Back Upward	21100/2535	0.315	1.005	0.317	2.36	--
	Edge A	21100/2535	0.211	1.005	0.212	2.65	--
	Edge B	21100/2535	0.025	1.005	0.025	1.77	--

Table 9: SAR Values of LTE Band 26,10MHz, QPSK

Temperature: 23.0~23.5°C, humidity: 62~64%.							
Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR (W/Kg),1g	Scaled Factor	Scaled SAR (W/Kg),1g	Power drift (%)	
1RB #0							
Body (0mm Separation) Hotspot	Face Upward	26865/831.5	0.103	1.104	0.114	0.25	--
	Back Upward	26775/822.5	0.115	1.140	0.131	1.22	--
		26865/831.5	**0.127**	1.104	**0.140**	0.24	**9**
		26965/841.5	0.120	1.151	0.138	2.36	--
	Edge A	26865/831.5	0.085	1.104	0.094	2.36	--
	Edge B	26865/831.5	0.069	1.104	0.076	-3.66	--
50%RB #0							
Body (0mm Separation) Hotspot	Face Upward	26865/831.5	0.085	1.059	0.090	4.12	--
	Back Upward	26865/831.5	0.113	1.059	0.120	1.58	--
	Edge A	26865/831.5	0.074	1.059	0.078	2.55	--
	Edge B	26865/831.5	0.052	1.059	0.055	2.33	--

Table 10: SAR Values of LTE Band 41,20MHz, QPSK

Temperature: 23.0~23.5°C, humidity: 62~64%.							
Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR (W/Kg),1g	Scaled Factor	Scaled SAR (W/Kg),1g	Power drift (%)	
1RB #0							
Body (0mm Separation) Hotspot	Face Upward	40620/2593	0.334	1.050	0.351	0.25	--
	Back Upward	39750/2506	0.515	1.067	0.550	1.22	--
		40620/2593	**0.576**	1.050	**0.605**	1.17	**10**
		41490/2680	0.534	1.057	0.359	1.36	--
	Edge A	40620/2593	0.336	1.050	0.353	2.31	--
	Edge B	40620/2593	0.088	1.050	0.092	2.45	--
50%RB #0							
Body (0mm Separation) Hotspot	Face Upward	40620/2593	0.215	1.279	0.275	-1.11	--
	Back Upward	40620/2593	0.351	1.279	0.449	2.36	--
	Edge A	40620/2593	0.218	1.279	0.279	3.15	--
	Edge B	40620/2593	0.055	1.279	0.070	-0.25	--

Table 11: SAR Values of Wi-Fi 802.11b

Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR(W/Kg)1g	Scaled Factor	Scaled SAR(W/Kg),1g	Power drift (%)	
Hotspot (0mm Separation)	Face Upward	1/2412	0.256	1.552	0.397	1.22	
		6/2437	**0.356**	1.393	**0.496**	0.25	**11**
		12/2462	0.331	1.005	0.333	0.36	
	Back Upward	6/2437	0.203	1.393	0.283	1.25	--
	Edge A	6/2437	0.189	1.393	0.263	1.52	--
	Edge D	6/2437	0.136	1.393	0.189	1.68	--

Table 12: SAR Values of Wi-Fi 802.11a

Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR(W/Kg)1g	Scaled Factor	Scaled SAR(W/Kg),1g	Power drift (%)	
Hotspot (0mm Separation)	Face Upward	5180/36	**0.631**	1.091	**0.688**	0.05	**12**
	Back Upward	5180/36	0.582	1.091	0.635	1.23	--
	Edge A	5180/36	0.542	1.091	0.591	2.33	--
	Edge D	5180/36	0.611	1.091	0.667	3.21	--

Table 15: SAR Values of CDMA BC0(850MHz) Band

Test Positions		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)				Plot No.
			SAR(W/Kg)1g	Scaled Factor	Scaled SAR(W/Kg),1g	Power drift (%)	
Hotspot (0mm Separation)	Face Upward	384/836.52	0.575	1.130	0.650	1.59	**--**
	Back Upward	384/836.52	**0.685**	1.130	**0.774**	1.32	**13**
	Edge A	384/836.52	0.123	1.130	0.139	2.33	--
	Edge B	384/836.52	0.362	1.130	0.406	2.17	--

Note:
Per KDB941225 D06 v02r01, When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested. As the manufacture requirement the separation distance use 5mm for Hotspot mode.
Per KDB Publication 941225 D01v03r01. RMC 12.2kbps was as primary mode SAR, when the primary mode SAR less than 1.2W/kg, secondary SAR (HSPA) was not requires.
When the 1-g SAR for the mid-band channel or the channel with the highest output power satisfy the following conditions, testing of the other channels in the band is not required. (Per KDB 447498 D01 General RF Exposure Guidance v06)
• ≤ 0.8 W/kg, when the transmission band is ≤ 100 MHz
• ≤ 0.6 W/kg, when the transmission band is between 100 MHz and 200 MHz
• ≤ 0.4 W/kg, when the transmission band is ≥ 200 MHz

11. Simultaneous Transmissions Analysis

Localized Specific Absorption Rate (SAR) of this portable wireless device has been measured in all cases requested by the relevant standards cited in Clause 6 of this report. Maximum localized SAR is **below** exposure limits specified in the relevant standards.

Simultaneous SAR

No.	Transmitter Combinations	Scenario Supported or not	Supported for Mobile Hotspot or not
1	GSM/CDMA+ BT	Yes	No
2	GSM/CDMA + WIFI	Yes	Yes
3	WCDMA +BT	Yes	No
4	WCDMA +WIFI	Yes	Yes
5	LTE+BT	Yes	No
6	LTE+WIFI	Yes	Yes
7	WIFI+BT	No	No

Simultaneous Tx Combination of GSM/CDMA/WCDMA/LTE and BT/WIFI (Body).

Test Position		Face	Back	Edge A	Edge B	Edge C	Edge D
Hotspot 0mm separation MAX 1-g SAR(W/Kg)	GPRS850	0.854	0.862	0.397	0.412	/	/
	GPRS1900	0.817	0.795	0.618	0.197	/	/
	WCDMA 850	0.069	0.072	0.061	0.045	/	/
	WCDMA 1900	0.209	0.393	0.171	0.286	/	/
	LTE Band2	0.364	0.249	0.216	0.063	/	/
	LTE Band4	0.279	0.249	0.196	0.165	/	/
	LTE Band5	0.077	0.095	0.036	0.061	/	/
	LTE Band7	0.263	0.350	0.268	0.038	/	/
	LTE Band26	0.114	0.140	0.094	0.076	/	/
	LTE Band41	0.351	0.605	0.353	0.092	/	/
	CDMA BC0	0.650	0.774	0.139	0.406	/	/
	WIFI 802.11b	0.496	0.283	0.263	/	/	0.189
	WIFI 802.11a	0.688	0.635	0.591	/	/	0.667
	BT	0.372*	0.372*	0.372*	0.372*	0.372*	0.372*
WIFI Simultaneous ∑1-g SAR(W/Kg)		1.542	1.497	1.209	/	/	/
BT Simultaneous ∑1-g SAR(W/Kg)		1.226	1.234	0.99	0.784	/	/

Simultaneous Tx Combination of GSM/CDMA/WCDMA/LTE and WIFI (Body).

The estimated SAR value with * Signal

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required

12. Measurement Uncertainty

No.	Uncertainty Component	Type	Uncertainty Value (%)	Probability Distribution	k	ci	Standard Uncertainty (%) ui(%)	Degree of freedom Veff or vi
	Measurement System							
1	– Probe Calibration	B	5.8	N	1	1	5.8	∞
2	– Axial isotropy	B	3.5	R	$\sqrt{3}$	0.5	1.43	∞
3	–Hemispherical Isotropy	B	5.9	R	$\sqrt{3}$	0.5	2.41	∞
4	– Boundary Effect	B	1	R	$\sqrt{3}$	1	0.58	∞
5	– Linearity	B	4.7	R	$\sqrt{3}$	1	2.71	∞
6	– System Detection Limits	B	1.0	R	$\sqrt{3}$	1	0.58	∞
7	Modulation response	B	3	N	1	1	3.00	
8	– Readout Electronics	B	0.5	N	1	1	0.50	∞
9	– Response Time	B	1.4	R	$\sqrt{3}$	1	0.81	∞
10	– Integration Time	B	3.0	R	$\sqrt{3}$	1	1.73	∞
11	– RF Ambient Conditions	B	3.0	R	$\sqrt{3}$	1	1.73	∞
12	– Probe Position Mechanical tolerance	B	1.4	R	$\sqrt{3}$	1	0.81	∞
13	– Probe Position with respect to Phantom Shell	B	1.4	R	$\sqrt{3}$	1	0.81	∞
14	– Extrapolation, Interpolation and Integration Algorithms for Max. SAR evaluation	B	2.3	R	$\sqrt{3}$	1	1.33	∞

	Uncertainties of the DUT							
15	– Position of the DUT	A	2.6	N	$\sqrt{3}$	1	2.6	5
16	– Holder of the DUT	A	3	N	$\sqrt{3}$	1	3.0	5
17	– Output Power Variation –SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.89	∞
Phantom and Tissue Parameters								
18	– Phantom Uncertainty(shape and thickness tolerances)	B	4	R	$\sqrt{3}$	1	2.31	∞
19	Uncertainty in SAR correction for deviation(in permittivity and conductivity)	B	2	N	1	1	2.00	
20	– Liquid Conductivity Target –tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	∞
21	– Liquid Conductivity –measurement Uncertainty)	B	4	N	$\sqrt{3}$	1	0.92	9
22	– Liquid Permittivity Target tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	∞
23	– Liquid Permittivity –measurement uncertainty	B	5	N	$\sqrt{3}$	1	1.15	∞
Combined Standard Uncertainty				RSS			10.63	
Expanded uncertainty (Confidence interval of 95 %)				K=2			21.26	

System Check Uncertainty

No.	Uncertainty Component	Type	Uncertainty Value (%)	Probability Distribution	k	ci	Standard Uncertainty (%) ui(%)	Degree of freedom Veff or vi
	Measurement System							
1	– Probe Calibration	B	5.8	N	1	1	5.8	∞

2	– Axial isotropy	B	3.5	R	$\sqrt{3}$	0.5	1.43	∞
3	—Hemispherical Isotropy	B	5.9	R	$\sqrt{3}$	0.5	2.41	∞
4	– Boundary Effect	B	1	R	$\sqrt{3}$	1	0.58	∞
5	– Linearity	B	4.7	R	$\sqrt{3}$	1	2.71	∞
6	– System Detection Limits	B	1	R	$\sqrt{3}$	1	0.58	∞
7	Modulation response	B	0	N	1	1	0.00	
8	– Readout Electronics	B	0.5	N	1	1	0.50	∞
9	– Response Time	B	0.00	R	$\sqrt{3}$	1	0.00	∞
10	– Integration Time	B	1.4	R	$\sqrt{3}$	1	0.81	∞
11	– RF Ambient Conditions	B	3.0	R	$\sqrt{3}$	1	1.73	∞
12	– Probe Position Mechanical tolerance	B	1.4	R	$\sqrt{3}$	1	0.81	∞
13	– Probe Position with respect to Phantom Shell	B	1.4	R	$\sqrt{3}$	1	0.81	∞
14	– Extrapolation, Interpolation and Integration Algorithms for Max. SAR evaluation	B	2.3	R	$\sqrt{3}$	1	1.33	∞
	Uncertainties of the DUT							
15	Deviation of experimental source from numberical source	A	4	N	1	1	4.00	5
16	Input Power and SAR drift measurement	A	5	R	$\sqrt{3}$	1	2.89	5
17	Dipole Axis to Liquid Distance	B	2	R	$\sqrt{3}$	1	1.2	∞

Phantom and Tissue Parameters								
18	– Phantom Uncertainty(shape and thickness tolerances)	B	4	R	$\sqrt{3}$	1	2.31	∞
19	Uncertainty in SAR correction for deviation(in permittivity and conductivity)	B	2	N	1	1	2.00	
20	– Liquid Conductivity Target –tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	∞
21	– Liquid Conductivity –measurement Uncertainty)	B	4	N	$\sqrt{3}$	1	0.92	9
22	– Liquid Permittivity Target tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	∞
23	– Liquid Permittivity –measurement uncertainty	B	5	N	$\sqrt{3}$	1	1.15	∞
Combined Standard Uncertainty				RSS			10.15	
Expanded uncertainty (Confidence interval of 95 %)				K=2			20.29	

13. Equipment List

This table is a complete overview of the SAR measurement equipment. Devices used during the test described are marked ☒.

	EQUIPMENT	Model	Serial number	Calibration Date	Due Date
☒	SAR Probe	SSE5	SN 43/15 EP276	2017/11/27	2018/11/26
☐	Dipole	SID750	SN 23/15 DIP0G750-378	2017/11/27	2018/11/26
☒	Dipole	SID900	SN 09/13 DIP0G900-215	2017/11/27	2018/11/26
☒	Dipole	SID1800	SN 09/13 DIP1G800-216	2017/11/27	2018/11/26
☒	Dipole	SID1900	SN 09/13 DIP1G900-218	2017/11/27	2018/11/26
☒	Dipole	SID2450	SN_09/13_DIP2G450-220	2017/11/27	2018/11/26
☒	Dipole	SID2600	SN 32/14_DIP2G600-338	2017/11/27	2018/11/26
☒	SAR Probe	SSE2	SN27/15 EPGO261	2017/11/27	2018/11/26
☒	Dipole	SWG5500	SN15/15 WGA39	2017/11/27	2018/11/26
☒	Multimeter	Keithley-2000	4085310	2017/09/08	2018/09/07
☒	System Simulator(R&S)	CMU200	A0304212	2017/11/08	2018/11/07
☒	System Simulator(Agilent 8960)	E5515C	GB 47200710	2017/11/08	2018/11/07
☒	System Simulator(R&S)	CMW500	130805	2017/08/29	2018/08/28
☒	Vector Network Analyzer(R&S)	ZVB8	A0802530	2017/05/04	2018/05/03
☒	PC 3.5 Fixed Match Calibration Kit	ZV-Z32	100571	2017/11/29	2018/11/28
☒	Dielectric Probe Kit	SCLMP	SN 09/13 OCPG51	2017/11/27	2018/11/26
☒	Signal Generator	SMU200A	A140801889	2017/05/04	2018/05/03
☒	Amplifier	Nucletudes	143060	2018/03/27	2019/03/28
☒	Directional Coupler	DC6180A	305827	2018/03/27	2019/03/28
☒	Power Meter	NRP2	A140401673	2018/03/27	2019/03/28
☒	Power Sensor	NPR-Z11	1138.3004.02-114072-nq	2018/03/27	2019/03/28
☒	Power Meter	NRVS	A0802531	2018/03/27	2019/03/28
☒	Power Sensor	NRV-Z4	100069	2018/03/27	2019/03/28

ANNEX A: Appendix A: SAR System performance Check Plots

(Please See Appendix A)

ANNEX B: Appendix B: SAR Measurement results Plots

(Please See Appendix B)

ANNEX C: Appendix C: Calibration reports

(Please See Appendix C)

ANNEX D: Appendix D: SAR Test Setup

(Please See Appendix D)

—End of the Report—