SAR TEST REPORT

for

Planet Computers Limited

Gemini

Model No.: Gemini 4G

FCC ID: 2AO7Q-X600M1

The MAX Report SAR(1g)	
Body SAR	0.780W/Kg
Head SAR	0.682W/Kg

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SAR TEST REPORT

Applicant : Planet Computers Limited

Product : Gemini

(A) Model No. : Gemini 4G

(B) Brand Name : N/A

(C) Power Supply : 3.85V

Measurement Standard Used:

- FCC 47 CFR Part 2 (2.1093)
- IEEE C95.1-1999
- IEEE 1528-2013
- FCC OET Bulletin 65 Supplement C (Edition 01-01)
- FCC KDB 447498 D01 v06
- FCC KDB 248227 D01 v02r02
- FCC KDB 616217 D04 v01r02
- FCC KDB 865664 D01/D02
- FCC KDB 941225 D01 v03r01
- FCC KDB 941225 D05 v02r05

FCC KDB 941225 D06 v02r01

FCC KDB 941225 D07 v01r02

FCC KDB 648474 D04 v01r03

The device described above is tested by Audix Technology (Shenzhen) Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The test results are contained in this test report and Audix Technology (Shenzhen) Co., Ltd. is assumed full responsibility for the accuracy and completeness of test. This report contains data that are not covered by the NVLAP accreditation. Also, this report shows that the EUT is technically compliant with the FCC SAR test requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shenzhen) Co., Ltd.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Date of Test : Mar.25~Aug.11, 2018 Report of date: Aug.14, 2018

Prepared by : Monica Liu for Kayli He / Assistant

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信華科技（深圳）有限公司 Audix Technology (Shenzhen) Co., Ltd. EMC 部門報告專用章 Stamp only for EMC Dept. Report

Approved & Authorized Signer

Signature: David Jin

David Jin / Manager

1. GENERAL INFORMATION

1.1.Description of Device (EUT)

Product : Gemini

Model No. : Gemini 4G

Radio : IEEE802.11 a/b/g/n/ac; Bluetooth V3.0+EDR; Bluetooth V4.0;
GSM Class B ;GPRS/EDGE Class 12; WCDMA cat 8; LTE rel 10

Power Class : GSM850 PCL5; PCS1900 PCL0; WCDMA Power Class 3; LTE Power Class 3

Operation Frequency : IEEE 802.11a: 5180MHz—5240MHz; 5745MHz—5825MHz
IEEE 802.11ac VHT20: 5180MHz—5240MHz; 5745MHz—5825MHz
IEEE 802.11ac VHT40: 5190MHz—5230MHz; 5755MHz—5795MHz
IEEE 802.11ac VHT80: 5210MHz; 5775MHz
IEEE 802.11b: 2412MHz—2462MHz
IEEE 802.11g: 2412MHz—2462MHz
IEEE802.11n HT20: 2412MHz—2462MHz; 5180MHz—5240MHz;
5745MHz—5825MHz
IEEE802.11n HT40: 2422MHz—2452MHz;
5190MHz—5230MHz; 5755MHz—5795MHz
Bluetooth : 2402-2480MHz
GSM: GSM 850: 824-849MHz; PCS 1900: 1850-1910MHz
WCDMA: Band 2: Uplink:1850-1910MHz, Downlink:1930-1990MHz
Band 5: Uplink:824-849MHz, Downlink:869-894MHz
LTE:

Band	Uplink	Downlink
Band 2	1850-1910MHz	1930-1990MHz
Band 4	1710-1755MHz	2110-2155MHz
Band 5	824-849MHz	869-894MHz
Band 12	699-716MHz	729-746MHz
Band 17	704-716MHz	734-746MHz
Band 41	2496MHz-2690MHz	2496MHz-2690MHz

Modulation Technology : IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)
IEEE 802.11a/g: OFDM(64QAM, 16QAM, QPSK, BPSK)
IEEE 802.11ac VHT20, VHT40, VHT80: OFDM(16QAM, 64QAM, 256QAM, QPSK, BPSK)
IEEE 802.11n HT20, HT40: OFDM (64QAM, 16QAM,QPSK,BPSK)
Bluetooth V3.0+EDR: GFSK, π/4DQPSK,8-DPSK
Bluetooth V4.0:GFSK
GSM, Edge: GMSK, 8PSK
WCDMA: QPSK,16QAM
LTE: QPSK,16QAM

Antenna Assembly Gain : Antenna Type: PIFA
Bluetooth: 2.0dBi
WIFI 2.4GHz: 2.0dBi
WIFI 5GHz: 0.42dBi
GSM: GSM850: -3.5dBi; PCS1900: 0.7dBi.
WCDMA: Band 2: 0.9dBi; Band 5: -3.1dBi.
LTE: Band 2: 0.4dBi; Band 4: -0.1dBi; Band 5: -3.0dBi;
Band 12: -3.0dBi; Band 17: -2.0dBi; Band 41: -1.3dBi.

Applicant	:	Planet Computers Limited Suite #9, 56 Sloane Square, London, SW1W 8AX, United Kingdom
Manufacturer	:	Planet Computers Limited Suite #9, 56 Sloane Square, London, SW1W 8AX, United Kingdom
Factory	:	SHENZHEN YIXU ELECTRONICS CO., LTD. Building B, Area E, Yuwei, Qingxiang Rd, Longhua, Shenzhen
Power Adapter	:	Manufacturer: Planet, M/N: TPA-10120125UUA-MTK; Cable: Unshielded, Detachable, 1.0m
USB Cable	:	Shielded, Detachable, 0.8m
Date of Test	:	Mar.25~Aug.11, 2018
Date of Receipt	:	Dec.26, 2017
Sample Type	:	Prototype production

2. GENERAL DESCRIPTION

2.1.Product Description For EUT

[None]

2.2.Applied Standards

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)
· IEEE C95.1-1999
· IEEE 1528-2013
· FCC OET Bulletin 65 Supplement C (Edition 01-01)
· FCC KDB 447498 D01 v06
· FCC KDB 248227 D01 v02r02
· FCC KDB 616217 D04 v01r02
· FCC KDB 865664 D01/D02
· FCC KDB 941125 D01 v03r01
· FCC KDB 941125 D05 v02r05
FCC KDB 941225 D06 v02r01
FCC KDB 941225 D07 v01r02
FCC KDB 648474 D04 v01r03

2.3.Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

2.4.Test Conditions

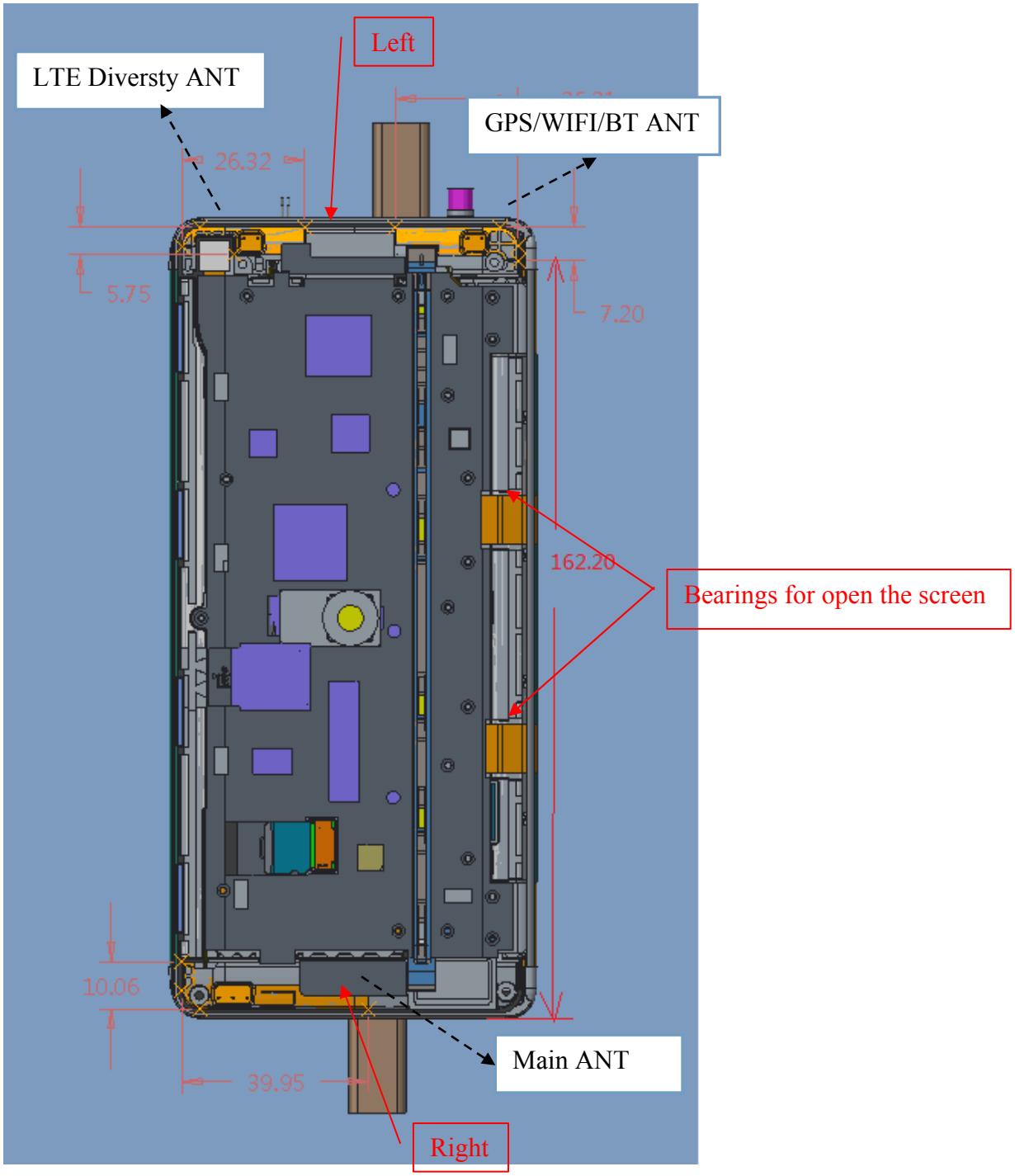
2.4.1. **Ambient Condition**

Ambient Temperature	20 to 24 ℃
Humidity	< 60 %

2.4.2. **Test Configuration**

The distance between the EUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during all tests.

2.5.Exposure Positions Consideration



Antenna	Description
WIFI/Bluetooth antenna	802.11 b/g/n HT20/n HT40/ac VHT20/ ac VHT40/ac VHT80/ Bluetooth3.0+EDR, Bluetooth4.0

Note:

1. The distance from the WLAN antenna to the back surface is 11mm
2. The distance from the main antenna to the back surface is 11mm.
3. The Diversity antenna only have Rx function
4. The WiFi/Bluetooth and the main antenna were located on the screen area of the device.

Sides for SAR tests Test distance: 0 mm(Body)										
Band	Body						Head Touch		Head (15°)	
	Back	Front	Top	Bottom	Left	Right	Left	Right	Left	Right
WLAN 2.4GHz	✓	✓	✓	✓	✓	X	✓	✓	✓	✓
WLAN 5GHz	✓	✓	✓	✓	✓	X	✓	✓	✓	✓
GSM	✓	✓	✓	✓	X	✓	✓	✓	✓	✓
WCDMA	✓	✓	✓	✓	X	✓	✓	✓	✓	✓
LTE	✓	✓	✓	✓	X	✓	✓	✓	✓	✓

Note:

1. **The length of the diagonal dimension of the EUT is less than 20cm.**
2. **The side which has a distance larger than 2.5cm from antenna can be excluded from SAR measurement.**
3. **This device support hotspot function.**

2.6.Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied. The 1-g SAR test exclusion threshold 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, where

- 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

According to the KDB447498 appendix A, the SAR test exclusion threshold for 2450MHz at 5mm test separation distances is 10 mW,5.2GHz is 7 mW, 5.4GHz and 5.8GHz is 6mW

Appendix A

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

Standalone SAR test exclusion considerations

Band/Mode	F(MHz)	SAR test exclusion threshold (mW)	RF output power		SAR test Exclusion
			dBm	mW	
Bluetooth	2441	10	6.00	3.98	Yes
2.4GHz WLAN	2450	10	18.00	63.10	NO
5.2GHz WLAN	5200	7	13.50	22.39	NO
5.8GHz WLAN	5800	6	14.50	28.18	NO
750MHz	750	16	24.00	251.19	NO
900MHz	900	16	34.00	2511.89	NO
1800MHz	1800	11	30.00	1000.00	NO
2600MHz	2600	10	24.00	251.19	NO

2.7.EUT Configuration and operation conditions for test.

EUT

(EUT: Gemini)

2.8.Test Equipments

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal Date	Validity Date	Cal. Agency
1.	DASY5 SAR Test System	Speag	TX60 L speag	F09/5B1H1/01	NCR	NCR	N/A
2.	Wireless Communication Test Set	Agilent	E5515C	GB44300243	Apr.22,17	Apr.21,18	CEPREI
3.	Wireless Communication Test Set	Agilent	E5515C	GB443002433	Apr.23,18	Apr.22,19	LISAI
4.	Power Meter	Anritsu	ML2487A	6K00002472	Oct.14,17	Oct.13,18	CEPREI
5.	Power Sensor	Anritsu	MA2491A	0033005	Oct.14,17	Oct.13,18	CEPREI
6.	Signal Generator	HP	83732B	VS34490501	Apr.23,17	Apr.22, 18	CEPREI
7.	Signal Generator	HP	83732B	US34490501	Apr.23,18	Apr.22,19	LISAI
8.	Amplifier	Milmega	ZHL-42W	C620601316	NCR	NCR	N/A
9.	Dipole Validation Kits	Speag	D900V2	1d088	June.07.17	Jun.04, 20	TTL
10.	Dipole Validation Kits	Speag	D1800V2	2d186	June.05.17	Jun.02, 20	TTL
11.	Dipole Validation Kits	Speag	D2000V2	1055	June.06.17	Jun.03, 20	TTL
12.	Dipole Validation Kits	Speag	D5GHzV2	1102	May.25.17	May.22, 20	TTL
13.	Dipole Validation Kits	Speag	D750V3	1159	May.18,16	May.16, 19	SCS
14.	Dipole Validation Kits	Speag	D2600V2	1123	May.19,16	May.16, 19	SCS
15.	Attenuator	Mini-Circuits	VAT-10+	NO.1	Apr.22,17	Apr.21, 18	CEPREI
16.	Attenuator	Mini-Circults	15542 VAT-10+	31349 No.1	Oct.14,17	Oct.13,18	LISAI
17.	Data Acquisition Electronics	Speag	DAE4	899	Feb.08,18	Feb.07,19	TTL
18.	E-Field Probe	Speag	EX3DV4	3767	Mar.07,18	Mar.06,19	TTL
19.	Network Analyzer	Agilent	E5071B	MY42403549	Apr.22,17	Apr.21, 18	CEPREI
20.	ENA Series Analyzer	Agilent	E5071B	MY42403549	Apr.23,18	Apr.22,19	LISAI
21.	Test Software	Schmid&Partner Englinnering AG	DASY5	52.8.7.1137	N/A	N/A	N/A
22.	Radio Communication Analyzer	ANRITSU	MT8820C	6201091003	Oct.15,17	Oct.14,18	CEPREI
23.	Radio Communication Analyzer	R&S	CMW500	103247	Jan.12,18	Jan.11, 19	CEPREI

Note: Dipole antenna calibration interval is 3 year, annual check result to be follow (Refer to KDB 865664, Dipole calibration)

2.9.Laboratory Environment

Temperature	Min:20℃,Max.25℃
Relative humidity	Min. = 30%, Max. = 70%
Note: Ambient noise is checked and found very low and in compliance with requirement of standards.	

2.10. Measurement Uncertainty

Test Item	Uncertainty
Uncertainty for SAR test	1g: 21.14
	10g: 20.64
Uncertainty for test site temperature and humidity	0.6℃

Source	Type	Uncertainly Value (%)	Probability Distribution	K	C1(1g)	C1(10g)	Standard uncertainty ul(%)1g	Standard uncertainty ul(%)10g	Degree of freedom Veff or Vi
Measurement system repetivity	A	0.5	N	1		1	0.5	0.5	9
Probe calibration	B	5.9	N	1	1	1	5.9	5.9	∞
Isotropy	B	4.7	R	√3	1	1	2.7	2.7	∞
Linearity	B	4.7	R	√3	1	1	2.7	2.7	∞
Probe modulation response	B	0	R	√3	1	1	0	0	∞
Detection limits	B	1.0	R	√3	1	1	0.6	0.6	∞
Boundary effect	B	1.9	R	√3	1	1	1.1	1.1	∞
Readout electronics	B	1.0	N	1	1	1	1.0	1.0	∞
Response time	B	0	R	√3	1	1	0	0	∞
Integration time	B	4.32	R	√3	1	1	2.5	2.5	∞
RF ambient conditions – noise	B	0	R	√3	1	1	0	0	∞
RF ambient conditions – reflections	B	3	R	√3	1	1	1.73	1.73	∞
Probe positioner mech. Restrictions	B	0.4	R	√3	1	1	0.2	0.2	∞
Probe positioning with respect to phantom shell	B	2.9	R	√3	1	1	1.7	1.7	∞
Post-processing	B	0	R	√3	1	1	0	0	∞
Test sample related									
Device holder uncertainty	A	2.94	N	1	1	1	2.94	2.94	M-1
Test sample positioning	A	4.1	N	1	1	1	4.1	4.1	M-1
Power scaling	B	5.0	R	√3	1	1	2.9	2.9	∞
Drift of output power (measured SAR drift)	B	5.0	R	√3	1	1	2.9	2.9	∞
Phantom and set-up									
Phantom uncertainty (shape and thickness tolerances)	B	4.0	R	√3	1	1	2.3	2.1	∞
Algorithm for correcting SAR for deviations in permittivity and conductivity	B	1.9	N	1	1	0,84	1,9	1,6	∞
Liquid conductivity (meas.)	A	0.55	N	1	0.78	0.71	0.24	0.21	M-1
Liquid permittivity (meas.)	A	0.19	N	1	0.23	0.26	0.09	0.06	M
Liquid permittivity – temperature uncertainty	A	5.0	R	√3	0,78	0,71	1.4	1.1	∞
Liquid conductivity – temperature uncertainty	A	5.0	R	√3	0.23	0,26	1.2	0.8	∞
Combined standard uncertainty	$u_c' = \sqrt{\sum_{i=1}^{23} c_i^2 u_i^2}$						**10.57**	**10.32**	
Expanded uncertainty (95 % conf. interval)	$u_e = 2u_c$		N		K=2		**21.14**	**20.64**	

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.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	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
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	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
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

3. MEASURE PROCEDURES

3.1.General description of test procedures

For the 802.11a/b/g SAR body tests, a communication link is set up with the test mode software for WIFI mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Each channel should be tested at the lowest data rate. Testing at higher data rates is not required when the maximum average output power is less than 0.25dB higher than those measured at the lowest data rate.

802.11b/g operating modes are tested independently according to the service requirements in each frequency band.802.11b/g modes are tested on channels1,6,11;however,if output power reduction is necessary for channels 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels must be tested instead.

SAR is not required for 802.11g channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels. When the maximum average output channel in each frequency band is not included in the “default test channels”, the maximum channel should be tested instead of an adjacent “default test channels”, these are referred to as the “required test channels” and are illustrated in table 1.

Please apply the following guidance for SAR testing:

1. Please use a 0 mm (touching) test separation distance on the flat phantom during SAR testing of this device. This separation distance is based on the guidance found in FCC KDB Publication 447498 D01, Section 5.2.3 3)
2. Please utilize a body tissue simulating liquid (TSL) of the appropriate frequency during SAR testing.
3. Please use the guidance found in FCC KDB Publication 447498 D01 to determine which sides of the device need to be tested for SAR.
4. FCC KDB Publication 248227 D01 should be used for selection of the WiFi channels, data rates, etc.
5. Use the Voice(GSM) mode and choose the channel which has the maximum output power(include the tune up procedure) for GSM850 and PCS1900 SAR Test.
6. Use the RMC mode and choose the channel which has the maximum output power(include the tune up procedure) for the WCDMA 3G SAR test.
7. Test LTE SAR with QPSK Modulation,1RB allocation and choose the channel which has the maximum output power(include the tune up procedure) for the primary SAR test.

4. SAR MEASUREMENTS SYSTEM

4.1.SAR Measurement Set-up

DASY5 system for performing compliance tests consists of the following items:

(1) A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).

(2) A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage It issue simulating liquid. The probe is equipped with an optical surface detector system.

(3) A data acquisition electronic (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.

(4) A unit to operate the optical surface detector which is connected to the EOC.

(5) The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.

(6) The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003.

(7) DASY5 software and SEMCAD data evaluation software.

(8) Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

(9) The generic twin phantom enabling the testing of left-hand and right-hand usage.

(10) The device holder for handheld mobile phones.

(11) Tissue simulating liquid mixed according to the given recipes.

(12) System validation dipoles allowing to validate the proper functioning of the system.

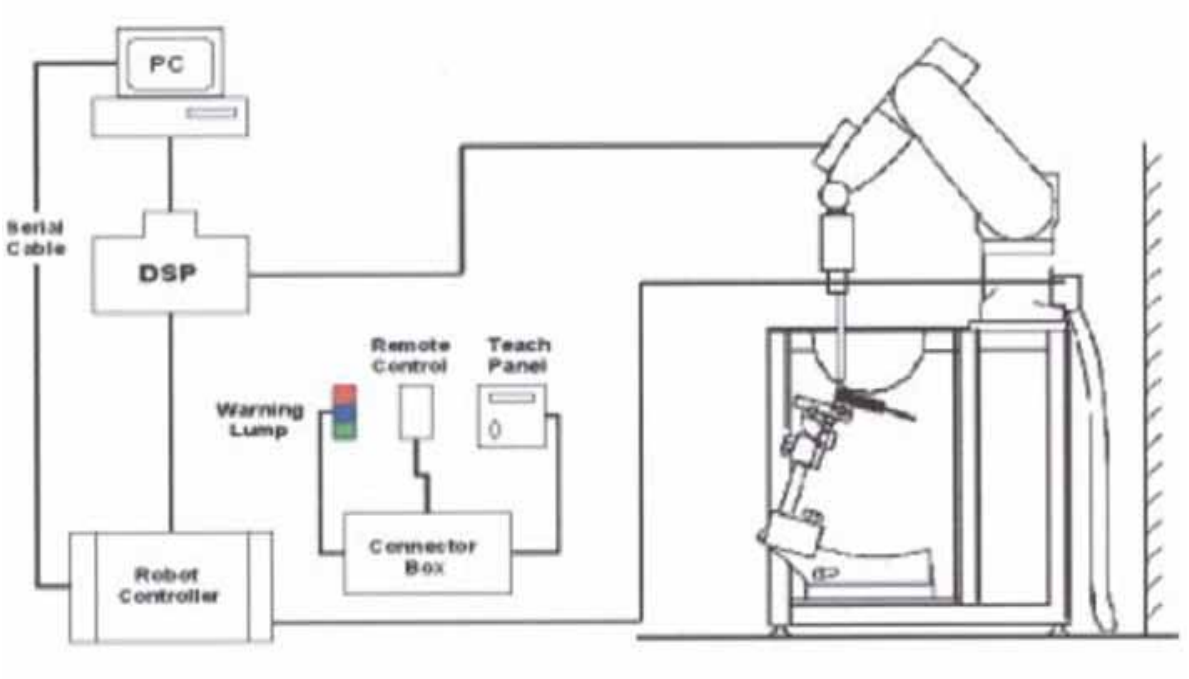


Figure 4.1 SAR Lab Test Measurement Set-up

4.2. ELI Phantom

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell Thickness	2.0 ± 0.2 mm (bottom plate)
Dimensions	Major axis: 600 mm Minor axis: 400 mm
Filling Volume	approx. 30 liters
Wooden Support	SPEAG standard phantom table

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.

Figure 6.2 Top View of Twin Phantom

A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters.

On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

The phantom can be used with the following tissue simulating liquids:

*Water-sugar based liquid
*Glycol based liquids

4.3.Device Holder for SAM Twin Phantom

The SAR in the Phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source in 5 mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ± 20%. An accurate device position is therefore crucial for accurate and repeatable measurement. The position in which the devices must be measured, are defined by the standards.

The DASY5 device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (EPR).

Thus the device needs no repositioning when changing the angles.

The DASY5 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε_r=3 and loss tangent δ 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

Figure 4.3 Device Holder

4.4.DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangul -ar configuration and optimized for dosimetric evaluation.

Figure 4.4 EX3DV4 E-field Probe

4.4.1. EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2dB (noise: typically < 1 µW/g)
Dimensions	Overall length: PRS-T2 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

4.5.E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

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

Where: Δt = Exposure time (30 seconds),
C = Heat capacity of tissue (brain or muscle),
ΔT = Temperature increase due to RF exposure.
Or

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

Where:
σ = Simulated tissue conductivity,
ρ = Tissue density (kg/m3).

4.6.Scanning procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The ”reference“ and ”drift“ measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure.The indicated drift is mainly the variation of the EUT’s output power and should vary max. ± 5 %.

The ”surface check“ measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles.

The difference between the optical surface detection and the actual surface depends on the Probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged.

After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

Zoom Scan

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY5 system allows evaluations that combine measured data and robot positions, such as:

- · maximum search
- · extrapolation
- · boundary correction
- · peak search for averaged SAR

During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space.They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

5. DATA STORAGE AND EVALUATION

5.1.Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for thedata evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

5.2.Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- Diode compression point	Dcpi
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	
	- Density	

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$Vi = Ui + Ui2 \cdot c f / d c pi$$

With ***Vi*** = compensated signal of channel i (i = x, y, z)

Ui = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcpi = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes: $E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$

H-field probes: $H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$

With ***Vi*** = compensated signal of channel i (i = x, y, z)

Normi = sensor sensitivity of channel i (i = x, y, z)

ConvF = sensitivity enhancement in solution

aij = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

Ei = electric field strength of channel i in V/m

Hi = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_x^2 + E_Y^2 + E_z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = (E_{tot}^2 \cdot \quad) / (\quad \cdot 1000)$$ with

SAR = local specific absorption rate in mW/g

Etot = total field strength in V/m

= conductivity in [mho/m] or [Siemens/m]

= equivalent tissue density in g/cm3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$P_{pwe} = E_{tot}^2 / 3770$ or $P_{pwe} = H_{tot}^2 \cdot 37.7$

with ***Ppwe*** = equivalent power density of a plane wave in mW/cm2

Etot = total electric field strength in V/m

Htot = total magnetic field strength in A/m

6. SYSTEM CHECK

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulates, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the ANNEX A.

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.

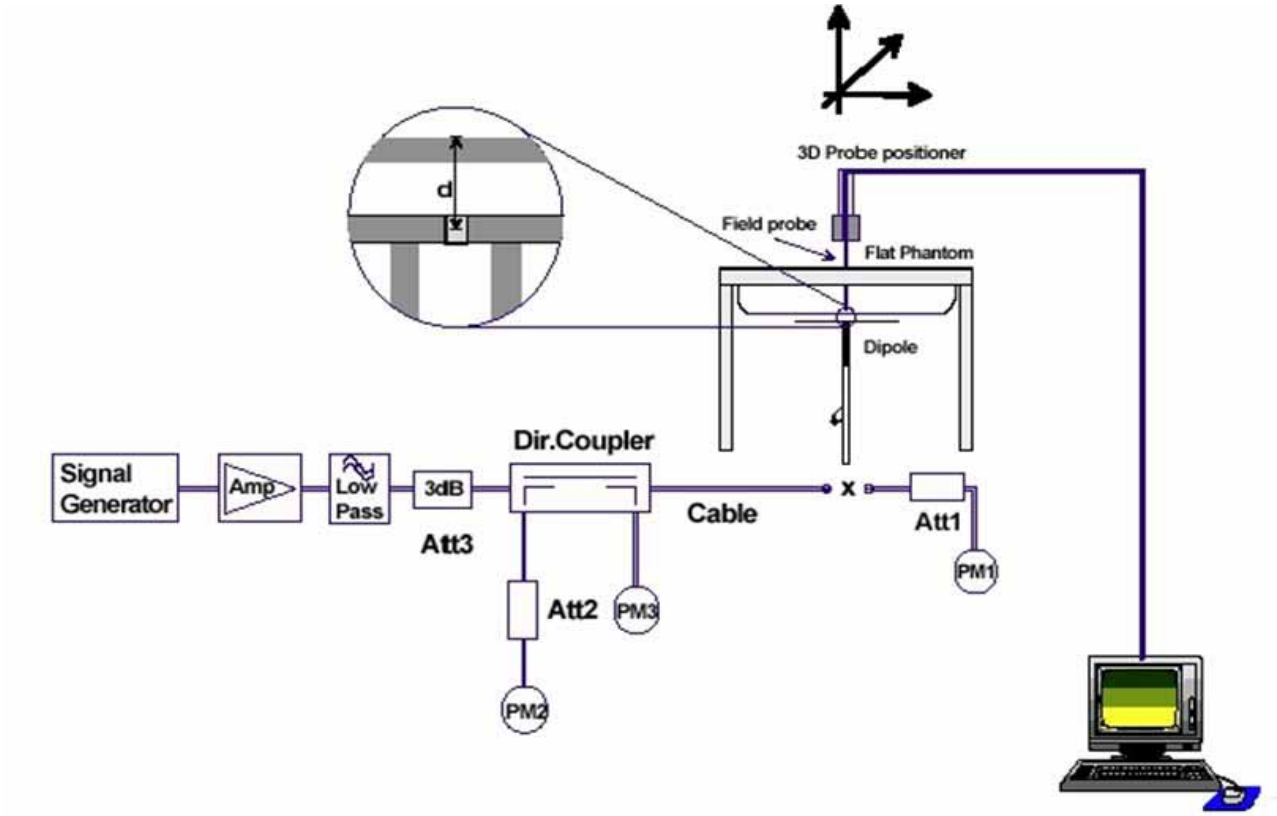


Figure 6.1: System Check Set-up

7. TEST RESULTS

7.1.Output power

(WIFI 2.4GHz)

Test Mode	Data Rate	CH	output Power (dBm)
11b	1Mbps	CH1	17.69
		CH6	17.67
		CH11	17.88
	2Mbps	CH1	17..45
		CH6	17.52
		CH11	17.62
	5.5Mbps	CH1	17.42
		CH6	17.39
		CH11	17.43
	11Mbps	CH1	17.22
		CH6	17.20
		CH11	17.24
11g	6Mbps	CH1	15.78
		CH6	15.69
		CH11	16.06
	9Mbps	CH1	15.32
		CH6	15.30
		CH11	15.45
	12Mbps	CH1	15.24
		CH6	15.18
		CH11	15.26
	18Mbps	CH1	15.20
		CH6	15.15
		CH11	15.23
	24Mbps	CH1	15.18
		CH6	15.10
		CH11	15.32
	36Mbps	CH1	15.16
		CH6	15.24
		CH11	15.29
	48Mbps	CH1	15.14
		CH6	15.18
		CH11	15.24
	54Mbps	CH1	14.98
		CH6	15.02
		CH11	15.09

11n HT20	MCS 0	CH1	15.54
		CH6	15.58
		CH11	15.89
	MCS 1	CH1	15.32
		CH6	15.34
		CH11	15.52
	MCS 2	CH1	15.29
		CH6	15.24
		CH11	15.30
	MCS 3	CH1	15.21
		CH6	15.19
		CH11	15.29
	MCS 4	CH1	15.18
		CH6	15.15
		CH11	15.26
	MCS 5	CH1	15.15
		CH6	15.12
		CH11	15.21
	MCS 6	CH1	15.12
		CH6	15.16
		CH11	15.22
	MCS 7	CH1	15.09
		CH6	15.07
		CH11	15.16
11n HT40	MCS 0	CH3	15.22
		CH6	15.10
		CH9	15.27
	MCS 1	CH3	15.12
		CH6	15.05
		CH9	15.18
	MCS 2	CH3	15.10
		CH6	15.06
		CH9	15.13
	MCS 3	CH3	15.04
		CH6	15.02
		CH9	15.09
	MCS 4	CH3	14.99
		CH6	14.95
		CH9	15.03
	MCS 5	CH3	14.92
		CH6	14.89
		CH9	15.02
	MCS 6	CH3	14.86
		CH6	14.89
		CH9	14.98
	MCS 7	CH3	14.82
		CH6	14.86
		CH9	14.95

Notes:

1. Use the data rate with the maximum output level for the SAR test.
2. BT and WIFI can't transmit at same time.

(WIFI 5GHz Band 1)

Test Mode	Data Rate	Frequency (MHz)	output power (dBm)
11a	6Mbps	5180	13.27
		5200	13.40
		5240	13.17
	9Mbps	5180	13.20
		5200	13.21
		5240	13.08
	12Mbps	5180	13.15
		5200	13.16
		5240	13.04
	18Mbps	5180	13.10
		5200	13.08
		5240	13.02
	24Mbps	5180	13.05
		5200	13.02
		5240	12.98
	36Mbps	5180	13.02
		5200	12.98
		5240	12.93
	48Mbps	5180	12.98
		5200	12.86
		5240	12.80
	54Mbps	5180	12.92
		5200	12.83
		5240	12.78
11n HT20	MCS 0	5180	12.74
		5200	13.24
		5240	12.90
	MCS 1	5180	12.56
		5200	13.10
		5240	12.75
	MCS 2	5180	12.45
		5200	13.04
		5240	12.60
	MCS 3	5180	12.42
		5200	13.02
		5240	12.53
	MCS 4	5180	12.40
		5200	12.95
		5240	12.45
	MCS 5	5180	12.34
		5200	12.86
		5240	12.42
	MCS 6	5180	12.30
		5200	12.75
		5240	12.20
	MCS 7	5180	12.24
		5200	12.60
		5240	12.15

11n HT40	MCS 0	5190	13.36
		5230	13.17
	MCS 1	5190	13.26
		5230	13.10
	MCS 2	5190	13.20
		5230	13.02
	MCS 3	5190	13.15
		5230	12.96
	MCS 4	5190	13.05
		5230	12.85
	MCS 5	5190	12.98
		5230	12.75
	MCS 6	5190	12.86
		5230	12.70
	MCS 7	5190	12.76
		5230	12.58
11ac VHT20	MCS 0	5180	13.08
		5200	13.21
		5240	12.97
	MCS 1	5180	12.90
		5200	12.98
		5240	12.70
	MCS 2	5180	12.85
		5200	12.89
		5240	12.65
	MCS 3	5180	12.70
		5200	12.78
		5240	12.56
	MCS 4	5180	12.65
		5200	12.68
		5240	12.45
	MCS 5	5180	12.59
		5200	12.50
		5240	12.43
	MCS 6	5180	12.46
		5200	12.38
		5240	12.30
	MCS 7	5180	12.34
		5200	12.29
		5240	12.24
	MCS 8	5180	12.30
		5200	12.24
		5240	12.21

11ac VHT40	MCS 0	5190	13.41
		5230	13.24
	MCS 1	5190	13.28
		5230	13.15
	MCS 2	5190	13.21
		5230	13.09
	MCS 3	5190	13.15
		5230	13.05
	MCS 4	5190	13.09
		5230	13.02
	MCS 5	5190	13.02
		5230	12.98
	MCS 6	5190	12.95
		5230	12.86
	MCS 7	5190	12.89
		5230	12.80
	MCS 8	5190	12.82
		5230	12.79
11ac VHT80	MCS 0	5210	13.37
	MCS 1	5210	13.25
	MCS 2	5210	13.19
	MCS 3	5210	13.12
	MCS 4	5210	13.06
	MCS 5	5210	13.02
	MCS 6	5210	12.92
	MCS 7	5210	12.86
	MCS 8	5210	12.83

Note: Use the data rate which has the maximum output power for the output power test

(WIFI 5GHz Band 4)

Test Mode	Data Rate	Frequency (MHz)	output power (dBm)
11a	6Mbps	5745	13.34
		5785	14.07
		5825	13.63
	9Mbps	5745	13.20
		5785	13.86
		5825	13.52
	12Mbps	5745	13.16
		5785	13.80
		5825	13.45
	18Mbps	5745	13.10
		5785	13.72
		5825	13.35
	24Mbps	5745	13.06
		5785	13.62
		5825	13.24
	36Mbps	5745	13.02
		5785	13.54
		5825	13.19
	48Mbps	5745	12.98
		5785	13.24
		5825	13.08
	54Mbps	5745	12.94
		5785	13.10
		5825	13.02
11n HT20	MCS 0	5745	13.29
		5785	13.65
		5825	13.41
	MCS 1	5745	13.12
		5785	13.40
		5825	13.25
	MCS 2	5745	13.06
		5785	13.24
		5825	13.18
	MCS 3	5745	13.02
		5785	13.12
		5825	13.16
	MCS 4	5745	12.98
		5785	13.02
		5825	13.06
	MCS 5	5745	12.82
		5785	12.92
		5825	12.93
	MCS 6	5745	12.76
		5785	12.84
		5825	12.83
	MCS 7	5745	12.64
		5785	12.72
		5825	12.67

11n HT40	MCS 0	5755	13.51
		5795	13.93
	MCS 1	5755	13.40
		5795	13.75
	MCS 2	5755	13.32
		5795	13.62
	MCS 3	5755	13.28
		5795	13.56
	MCS 4	5755	13.20
		5795	13.49
	MCS 5	5755	13.18
		5795	13.40
	MCS 6	5755	13.12
		5795	13.29
	MCS 7	5755	13.09
		5795	13.21
11ac VHT20	MCS 0	5745	13.32
		5785	13.73
		5825	13.44
	MCS 1	5745	13.20
		5785	13.42
		5825	13.16
	MCS 2	5745	13.12
		5785	13.36
		5825	13.08
	MCS 3	5745	12.98
		5785	13.12
		5825	12.96
	MCS 4	5745	12.90
		5785	13.08
		5825	12.52
	MCS 5	5745	12.80
		5785	13.00
		5825	12.45
	MCS 6	5745	12.65
		5785	12.86
		5825	12.35
	MCS 7	5745	12.52
		5785	12.72
		5825	12.22
	MCS 8	5745	12.42
		5785	12.56
		5825	12.19

11ac VHT40	MCS 0	5755	13.50
		5795	13.86
	MCS 1	5755	13.36
		5795	13.52
	MCS 2	5755	13.20
		5795	13.45
	MCS 3	5755	13.10
		5795	13.28
	MCS 4	5755	13.02
		5795	13.18
	MCS 5	5755	12.98
		5795	13.08
	MCS 6	5755	12.84
		5795	13.02
	MCS 7	5755	12.76
		5795	12.92
	MCS 8	5755	12.67
		5795	12.83
11ac VHT80	MCS 0	5775	13.47
	MCS 1	5775	13.32
	MCS 2	5775	13.20
	MCS 3	5775	13.08
	MCS 4	5775	12.98
	MCS 5	5775	12.85
	MCS 6	5775	12.75
	MCS 7	5775	12.62
	MCS 8	5775	12.53

Note: 1.Use the data rate which has the maximum output power for the SAR test
2.Higher maximum output power is not specified for the other channels except the channels in above table.

(GSM/GPRS)

RF Air interface	Mode	Channel	Output power(dBm)
GSM 850	Voice(GSM)	128	33.5
		190	33.3
		251	33.3
	GPRS 1Slot	128	32.5
		190	32.1
		251	32.2
	GPRS 2 Slot	128	32.2
		190	32.1
		251	32.2
	GPRS 3 Slot	128	32.2
		190	32.0
		251	32.1
	GPRS 4 Slot	128	32.1
		190	31.9
		251	32.0
	EGPRS 1 Slot	128	30.4
		190	30.3
		251	30.3
	EGPRS 2 Slot	128	30.0
		190	30.2
		251	29.8
	EGPRS 3 Slot	128	30.0
		190	30.1
		251	29.9
	EGPRS 4 Slot	128	30.0
		190	30.0
		251	29.9

PCS 1900	Voice(GSM)	512	29.6
		661	29.5
		810	29.5
	GPRS 1Slot	512	29.2
		661	29.2
		810	28.2
	GPRS 2Slot	512	29.0
		661	29.1
		810	29.1
	GPRS 3Slot	512	29.1
		661	29.1
		810	29.1
	GPRS 4Slot	512	29.1
		661	29.0
		810	29.0
	EGPRS 1Slot	512	27.6
		661	27.6
		810	27.5
	EGPRS 2Slot	512	27.4
		661	27.4
		810	27.3
	EGPRS 3Slot	512	27.3
		661	27.3
		810	27.2
	EGPRS 4Slot	512	27.3
		661	27.2
		810	27.2

(WCDMA)

Band	Channel	RMC	HSPA+	HSDPA	HSUPA	DC-HSDPA
2	9262	26.67	26.18	26.12	26.14	26.08
	9400	26.46	26.10	26.09	26.10	26.09
	9538	26.49	26.11	26.10	26.12	26.10
5	4132	27.84	26.94	26.84	26.86	26.75
	4183	27.77	26.97	26.81	26.83	26.78
	4233	27.66	26.94	26.82	26.84	26.74

LTE Band 2

Bandwidth	RB size/offset	Frequency(MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1RB high	1850.7	22.7	22.3
		1880	22.5	22.1
		1909.3	22.4	22.0
	1RB low	1850.7	22.7	22.3
		1880	22.4	22.1
		1909.3	22.4	22.0
	1RB Mid	1850.7	22.4	22.3
		1880	22.3	22.1
		1909.3	22.3	22.0
	50% RB mid	1850.7	22.8	21.9
		1880	22.6	21.7
		1909.3	22.5	21.6
	50% RB low	1850.7	22.4	21.6
		1880	22.5	21.6
		1909.3	22.4	21.6
	50% RB high	1850.7	22.3	21.6
		1880	22.4	21.5
		1909.3	22.4	21.4
	100% RB	1850.7	21.8	20.8
		1880	21.6	20.7
		1909.3	21.5	20.6

3MHz	1RB high	1851.5	22.9	22.4
		1880	22.7	22.3
		1908.5	22.6	22.2
	1RB low	1851.5	22.8	22.4
		1880	22.7	22.3
		1908.5	22.6	22.2
	1RB mid	1851.5	22.6	22.1
		1880	22.6	22.0
		1908.5	22.5	22.0
	50% RB mid	1851.5	21.9	21.0
		1880	21.7	20.8
		1908.5	21.6	20.8
	50% RB low	1851.5	21.8	20.9
		1880	21.7	20.9
		1908.5	21.6	20.8
	50% RB high	1851.5	21.6	20.8
		1880	21.6	20.7
		1908.5	21.5	20.7
	100% RB	1851.5	21.9	20.8
		1880	21.7	20.6
		1908.5	21.6	20.5

5MHz	1RB high	1852.5	22.9	22.6
		1880	22.8	22.5
		1907.5	22.7	22.4
	1RB low	1852.5	22.9	22.6
		1880	22.8	22.5
		1907.5	22.7	22.4
	1RB mid	1852.5	22.7	22.3
		1880	22.6	22.2
		1907.5	22.6	22.2
	50% RB mid	1852.5	21.8	21.0
		1880	21.6	20.8
		1907.5	21.6	20.7
	50% RB low	1852.5	21.6	20.9
		1880	21.5	20.8
		1907.5	21.5	20.8
	50% RB high	1852.5	21.6	20.7
		1880	21.5	20.7
		1907.5	21.5	20.7
	100% RB	1852.5	21.8	20.8
		1880	21.7	20.7
		1907.5	21.6	20.6

10MHz	1RB high	1855	22.8	22.4
		1880	22.7	22.3
		1905	22.6	22.3
	1RB low	1855	22.9	22.4
		1880	22.8	22.3
		1905	22.7	22.3
	1RB mid	1855	22.6	22.2
		1880	22.6	22.2
		1905	22.5	22.1
	50% RB mid	1855	21.9	20.9
		1880	21.7	20.7
		1905	21.6	20.7
	50% RB low	1855	21.6	20.8
		1880	21.5	20.8
		1905	21.5	20.7
	50% RB high	1855	21.6	20.7
		1880	21.6	20.6
		1905	21.5	20.6
	100% RB	1855	21.9	20.8
		1880	21.7	20.7
		1905	21.7	20.6

15MHz	1RB high	1857.5	22.7	22.3
		1880	22.4	22.1
		1902.5	22.3	22.1
	1RB low	1857.5	22.7	22.3
		1880	22.4	22.1
		1902.5	22.3	22.1
	1RB mid	1857.5	22.4	22.0
		1880	22.3	22.0
		1902.5	22.3	21.9
	50% RB mid	1857.5	21.8	20.8
		1880	21.7	20.7
		1902.5	21.6	20.7
	50% RB low	1857.5	21.6	20.8
		1880	21.6	20.8
		1902.5	21.5	20.7
	50% RB high	1857.5	21.6	20.8
		1880	21.6	20.7
		1902.5	21.5	20.7
	100% RB	1857.5	21.8	20.8
		1880	21.7	20.7
		1902.5	21.6	20.7

20MHz	1RB high	1860	22.9	22.6
		1880	22.8	22.5
		1900	22.7	22.4
	1RB low	1860	23.2	22.8
		1880	23.0	22.7
		1900	22.9	22.6
	1RB mid	1860	22.7	22.4
		1880	22.6	22.3
		1900	22.7	22.3
	50% RB mid	1860	21.8	20.8
		1880	21.7	20.6
		1900	21.7	20.7
	50% RB low	1860	21.7	20.7
		1880	21.7	20.7
		1900	21.6	20.6
	50% RB high	1860	21.6	20.6
		1880	21.5	20.6
		1900	21.5	20.5
	100% RB	1860	21.8	20.8
		1880	21.7	20.7
		1900	21.7	20.7

LTE Band 4

Bandwidth	RB size/offset	Frequency(MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1RB high	1710.7	22.7	22.2
		1732.5	22.7	22.3
		1754.3	22.7	22.3
	1RB low	1710.7	22.7	22.2
		1732.5	22.7	22.2
		1754.3	22.7	22.3
	1RB mid	1710.7	22.6	22.2
		1732.5	22.5	22.3
		1754.3	22.5	22.2
	50% RB mid	1710.7	22.8	21.8
		1732.5	22.8	21.9
		1754.3	22.8	21.9
	50% RB low	1710.7	22.6	21.6
		1732.5	22.6	21.5
		1754.3	22.6	21.3
	50% RB high	1710.7	22.5	21.4
		1732.5	22.6	21.3
		1754.3	22.5	21.3
	100% RB	1710.7	21.8	20.8
		1732.5	21.8	20.9
		1754.3	21.8	20.9

3MHz	1RB high	1711.5	23.0	22.4
		1732.5	22.9	22.4
		1753.5	22.9	22.5
	1RB low	1711.5	23.0	22.3
		1732.5	22.9	22.4
		1753.5	22.9	22.5
	1RB mid	1711.5	22.7	22.3
		1732.5	22.6	22.2
		1753.5	22.6	22.2
	50% RB mid	1711.5	21.9	21.0
		1732.5	21.9	21.0
		1753.5	21.9	21.0
	50% RB low	1711.5	21.8	20.9
		1732.5	21.7	20.9
		1753.5	21.8	21.0
	50% RB high	1711.5	21.8	21.0
		1732.5	21.8	20.9
		1753.5	21.9	20.9
	100% RB	1711.5	21.9	20.8
		1732.5	21.9	20.8
		1753.5	21.9	20.8

5MHz	1RB high	1712.5	22.9	22.4
		1732.5	23.0	22.7
		1752.5	23.0	22.6
	1RB low	1712.5	23.0	22.3
		1732.5	23.0	22.7
		1752.5	23.0	22.7
	1RB mid	1712.5	22.7	22.5
		1732.5	22.6	22.4
		1752.5	22.7	22.5
	50% RB mid	1712.5	21.8	20.9
		1732.5	21.9	21.0
		1752.5	21.9	21.0
	50% RB low	1712.5	21.6	20.9
		1732.5	21.6	20.9
		1752.5	21.5	20.9
	50% RB high	1712.5	21.6	20.9
		1732.5	21.6	21.0
		1752.5	21.6	20.9
	100% RB	1712.5	21.8	20.7
		1732.5	21.8	20.9
		1752.5	21.8	20.8

10MHz	1RB high	1715.0	22.9	22.4
		1732.5	22.8	22.4
		1750.0	22.9	22.4
	1RB low	1715.0	22.9	22.3
		1732.5	22.9	22.4
		1750.0	22.9	22.5
	1RB mid	1715.0	22.7	22.3
		1732.5	22.6	22.3
		1750.0	22.6	22.2
	50% RB mid	1715.0	21.9	20.8
		1732.5	21.9	20.8
		1750.0	21.9	20.9
	50% RB low	1715.0	21.7	20.8
		1732.5	21.8	20.8
		1750.0	21.7	20.7
	50% RB high	1715.0	21.7	20.8
		1732.5	21.6	20.8
		1750.0	21.7	20.7
	100% RB	1715.0	21.9	20.8
		1732.5	22.0	20.9
		1750.0	21.9	20.9

15MHz	1RB high	1717.5	22.6	22.2
		1732.5	22.6	22.2
		1747.5	22.6	22.3
	1RB low	1717.5	22.5	22.1
		1732.5	22.5	22.2
		1747.5	22.5	22.2
	1RB mid	1717.5	22.3	22.0
		1732.5	22.3	22.0
		1747.5	22.2	21.9
	50% RB mid	1717.5	21.8	20.8
		1732.5	21.8	20.8
		1747.5	21.9	20.9
	50% RB low	1717.5	21.7	20.8
		1732.5	21.7	20.8
		1747.5	21.6	20.8
	50% RB high	1717.5	21.7	20.7
		1732.5	21.7	20.8
		1747.5	21.6	20.7
	100% RB	1717.5	21.8	20.8
		1732.5	21.8	20.8
		1747.5	21.9	20.9

20MHz	1RB high	1720.0	22.9	22.6
		1732.5	23.0	22.7
		1745.0	23.1	22.7
	1RB low	1720.0	23.0	22.7
		1732.5	23.2	22.8
		1745.0	23.2	22.8
	1RB mid	1720.0	22.9	22.6
		1732.5	22.8	22.7
		1745.0	22.8	22.6
	50% RB mid	1720.0	21.9	20.8
		1732.5	21.9	20.8
		1745.0	22.0	20.9
	50% RB low	1720.0	21.8	20.8
		1732.5	21.7	20.8
		1745.0	21.7	20.9
	50% RB high	1720.0	21.7	20.7
		1732.5	21.6	20.8
		1745.0	21.6	20.8
	100% RB	1720.0	21.9	20.9
		1732.5	21.9	20.9
		1745.0	22.0	21.0

LTE Band 5

Bandwidth	RB size/offset	Frequency(MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1RB high	824.7	23.3	22.9
		836.5	23.3	22.9
		848.3	23.2	22.8
	1RB low	824.7	23.2	22.8
		836.5	23.2	22.8
		848.3	23.2	22.8
	1RB mid	824.7	23.1	22.6
		836.5	23.0	22.6
		848.3	23.0	22.5
	50% RB mid	824.7	23.3	22.4
		836.5	23.3	22.4
		848.3	23.3	22.4
	50% RB low	824.7	23.1	22.3
		836.5	23.1	22.3
		848.3	23.0	22.2
	50% RB high	824.7	22.9	22.2
		836.5	22.9	22.1
		848.3	23.0	22.2
	100% RB	824.7	22.3	21.4
		836.5	22.4	21.4
		848.3	22.3	21.4

3MHz	1RB high	825.5	23.5	23.1
		836.5	23.5	23.0
		847.5	23.5	23.0
	1RB low	825.5	23.5	23.0
		836.5	23.5	23.0
		847.5	23.5	23.0
	1RB mid	825.5	22.3	22.9
		836.5	22.4	22.9
		847.5	22.3	22.8
	50% RB mid	825.5	22.5	21.5
		836.5	22.5	21.6
		847.5	22.4	21.6
	50% RB low	825.5	22.3	21.5
		836.5	22.3	21.5
		847.5	22.2	21.4
	50% RB high	825.5	22.3	21.3
		836.5	22.3	21.3
		847.5	22.3	21.4
	100% RB	825.5	22.5	21.4
		836.5	22.4	21.3
		847.5	22.5	21.3

5MHz	1RB high	826.5	23.5	23.3
		836.5	23.5	23.2
		846.5	23.5	23.2
	1RB low	826.5	23.5	23.2
		836.5	23.5	23.3
		846.5	23.5	23.2
	1RB mid	826.5	23.4	23.1
		836.5	22.3	23.1
		846.5	22.3	23.2
	50% RB mid	826.5	22.4	21.5
		836.5	22.4	21.5
		846.5	22.4	21.5
	50% RB low	826.5	22.3	21.4
		836.5	22.3	21.4
		846.5	22.3	21.3
	50% RB high	826.5	22.3	21.3
		836.5	22.2	21.2
		846.5	22.2	21.2
	100% RB	826.5	22.4	21.4
		836.5	22.4	21.4
		846.5	22.4	21.4

10MHz	1RB high	829.0	23.4	22.6
		836.5	23.4	22.9
		844.0	23.4	22.9
	1RB low	829.0	23.5	23.2
		836.5	23.5	23.1
		844.0	23.4	23.0
	1RB mid	829.0	23.2	22.6
		836.5	23.3	22.5
		844.0	23.2	22.6
	50% RB mid	829.0	22.5	21.4
		836.5	22.4	21.3
		844.0	22.5	21.4
	50% RB low	829.0	22.3	21.2
		836.5	22.3	21.2
		844.0	22.2	21.2
	50% RB high	829.0	22.3	21.3
		836.5	22.2	21.3
		844.0	22.2	21.3
	100% RB	829.0	22.5	21.4
		836.5	22.4	21.4
		844.0	22.5	21.4

LTE Band 12

Bandwidth	RB size/offset	Frequency(MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1RB high	699.7	23.2	22.9
		707.5	23.2	22.8
		715.3	23.2	22.8
	1RB low	699.7	23.1	22.9
		707.5	23.1	22.8
		715.3	23.2	22.8
	1RB mid	699.7	23.1	22.6
		707.5	23.1	22.6
		715.3	23.0	22.7
	50% RB mid	699.7	23.1	22.4
		707.5	23.0	22.3
		715.3	23.0	22.3
	50% RB low	699.7	23.0	22.0
		707.5	23.0	22.0
		715.3	23.1	22.1
	50% RB high	699.7	23.0	22.0
		707.5	22.9	22.1
		715.3	22.8	22.1
	100% RB	699.7	22.2	21.4
		707.5	22.2	21.3
		715.3	22.2	21.3

3MHz	1RB high	700.5	23.5	23.0
		707.5	23.4	23.0
		714.5	23.4	22.6
	1RB low	700.5	23.4	23.1
		707.5	23.4	22.9
		714.5	23.4	22.6
	1RB mid	700.5	23.2	22.3
		707.5	23.1	22.4
		714.5	23.1	22.2
	50% RB mid	700.5	22.4	21.5
		707.5	22.3	21.5
		714.5	22.3	21.5
	50% RB low	700.5	22.1	21.4
		707.5	22.1	21.3
		714.5	22.1	21.3
	50% RB high	700.5	22.2	21.2
		707.5	22.1	21.3
		714.5	22.1	21.3
	100% RB	700.5	22.3	21.3
		707.5	22.3	21.2
		714.5	22.3	21.2

5MHz	1RB high	701.5	23.5	23.2
		707.5	23.5	23.3
		713.5	23.5	23.2
	1RB low	701.5	23.5	23.3
		707.5	23.5	23.2
		713.5	23.5	23.4
	1RB mid	701.5	23.2	23.1
		707.5	23.2	23.2
		713.5	23.1	23.1
	50% RB mid	701.5	22.4	21.4
		707.5	22.3	21.4
		713.5	22.4	21.5
	50% RB low	701.5	22.2	21.2
		707.5	22.2	21.2
		713.5	22.1	21.0
	50% RB high	701.5	22.1	21.2
		707.5	22.2	21.2
		713.5	22.2	21.2
	100% RB	701.5	22.3	21.3
		707.5	22.4	21.4
		713.5	22.3	21.3

10MHz	1RB high	704.0	23.3	23.1
		707.5	23.4	23.1
		711.0	23.3	22.9
	1RB low	704.0	23.5	23.3
		707.5	23.5	23.1
		711.0	23.4	23.0
	1RB mid	704.0	23.2	22.8
		707.5	23.1	22.7
		711.0	23.0	22.6
	50% RB mid	704.0	22.1	21.1
		707.5	22.3	21.4
		711.0	22.6	21.5
	50% RB low	704.0	22.1	21.2
		707.5	22.1	21.2
		711.0	22.2	21.1
	50% RB high	704.0	22.2	21.0
		707.5	22.1	21.2
		711.0	22.1	21.1
	100% RB	704.0	22.1	21.1
		707.5	22.5	21.5
		711.0	22.6	21.5

LTE Band 17

Bandwidth	RB size/offset	Frequency(MHz)	Power(dBm)	
			QPSK	16QAM
5MHz	1RB high	706.5	23.4	23.2
		710.0	23.5	23.3
		713.5	23.4	23.1
	1RB low	706.5	23.4	23.1
		710.0	23.4	23.2
		713.5	23.5	23.3
	1RB mid	706.5	23.2	23.0
		710.0	23.1	22.9
		713.5	23.2	22.8
	50% RB mid	706.5	22.2	21.3
		710.0	22.3	21.5
		713.5	22.3	21.4
	50% RB low	706.5	22.1	21.0
		710.0	22.1	21.2
		713.5	22.2	21.3
	50% RB high	706.5	22.2	21.2
		710.0	22.1	21.2
		713.5	22.1	21.0
	100% RB	706.5	22.3	21.3
		710.0	22.3	21.4
		713.5	22.2	21.2

10MHz	1RB high	709.0	23.3	22.9
		710.0	23.3	22.9
		711.0	23.2	22.8
	1RB low	709.0	23.4	22.9
		710.0	23.3	22.9
		711.0	23.3	22.9
	1RB mid	709.0	23.1	22.6
		710.0	23.1	22.3
		711.0	23.0	22.4
	50% RB mid	709.0	22.4	21.5
		710.0	22.5	21.5
		711.0	22.5	21.5
	50% RB low	709.0	22.2	21.4
		710.0	22.1	21.3
		711.0	22.1	21.3
	50% RB high	709.0	22.2	21.4
		710.0	22.2	21.4
		711.0	22.0	21.3
	100% RB	709.0	22.6	21.5
		710.0	22.6	21.5
		711.0	22.5	21.5

LTE Band 41

Bandwidth	RB size/offset	Frequency(MHz)	Power(dBm)	
			QPSK	16QAM
5MHz	1RB high	2557.5	23.4	22.7
		2605	22.9	22.3
		2652.5	22.8	22.1
	1RB low	2557.5	23.5	22.8
		2605	22.9	22.4
		2652.5	22.8	22.1
	1RB mid	2557.5	22.7	22.0
		2605	22.6	21.9
		2652.5	22.5	21.9
	50% RB mid	2557.5	22.2	21.4
		2605	21.6	20.8
		2652.5	21.6	20.8
	50% RB low	2557.5	21.5	21.0
		2605	21.4	20.9
		2652.5	21.5	20.8
	50% RB high	2557.5	21.4	20.8
		2605	21.5	20.9
		2652.5	21.5	20.9
	100% RB	2557.5	22.2	21.3
		2605	21.6	20.7
		2652.5	21.6	20.7

10MHz	1RB high	2560	23.1	22.6
		2605	22.6	22.7
		2650	22.6	22.5
	1RB low	2560	23.3	22.7
		2605	22.7	22.8
		2650	22.6	22.5
	1RB mid	2560	22.4	22.1
		2605	22.2	22.2
		2650	22.3	22.0
	50% RB mid	2560	22.2	21.3
		2605	21.7	20.7
		2650	21.7	20.7
	50% RB low	2560	21.5	20.9
		2605	21.5	20.9
		2650	21.4	21.0
	50% RB high	2560	21.5	20.9
		2605	21.3	20.8
		2650	21.6	21.0
	100% RB	2560	22.3	21.3
		2605	21.7	20.7
		2650	21.7	20.7

15MHz	1RB high	2562.5	22.8	22.8
		2605	22.4	22.4
		2647.5	22.3	22.2
	1RB low	2562.5	23.0	22.9
		2605	22.5	22.5
		2647.5	22.3	22.2
	1RB mid	2562.5	22.2	22.1
		2605	22.1	22.0
		2647.5	22.0	22.0
	50% RB mid	2562.5	22.2	21.3
		2605	21.7	20.8
		2647.5	21.7	20.8
	50% RB low	2562.5	21.6	20.9
		2605	21.7	20.9
		2647.5	21.7	20.8
	50% RB high	2562.5	21.7	20.9
		2605	21.6	20.9
		2647.5	21.6	20.9
	100% RB	2562.5	22.2	21.2
		2605	21.6	20.7
		2647.5	21.6	20.7

20MHz	1RB high	2565	23.1	22.6
		2605	22.6	22.3
		2645	22.6	22.2
	1RB low	2565	23.5	22.9
		2605	23.0	22.5
		2645	22.8	22.3
	1RB mid	2565	22.2	22.0
		2605	22.1	21.9
		2645	22.0	21.9
	50% RB mid	2565	22.2	21.2
		2605	21.6	20.7
		2645	21.7	20.8
	50% RB low	2565	21.6	21.0
		2605	21.6	20.9
		2645	21.5	20.9
	50% RB high	2565	21.5	20.8
		2605	21.4	20.8
		2645	21.6	20.9
	100% RB	2565	22.2	21.3
		2605	21.6	20.7
		2645	21.7	20.8

7.2.System Check for Body Tissue simulating liquid

Frequency	Description	SAR(W/kg) (±10 window)		Dielectric Parameters (±5% window)		Temp
		1g	10g	εr	σ(s/m)	℃
2450MHz	Recommended value	13.1 11.79 - 14.41	6.00 5.40 - 6.60	52.7 50.065 – 55.335	1.95 1.8525 – 2.0475	/
	Measurement value **2018-03-29**	12.97	5.94	52.41	1.949	**22.11**
5200MHz	Recommended value	19.125 17.2125-21.0375	5.4 4.86 - 5.94	49.0 46.55 – 51.45	5.3 5.035 – 5.565	/
	Measurement value **2018-03-25**	17.98	5.33	47.601	5.411	**22.05**
5800MHz	Recommended value	19.5 17.55 - 21.45	5.475 4.9275 - 6.0225	48.2 45.79 – 50.61	6.0 5.70 – 6.30	/
	Measurement value **2018-03-25**	18.04	5.16	47.87	5.997	**22.05**
750MHz	Recommended value	2.1225 1.91025–2.33475	1.3875 1.24875–1.52625	55.5 52.725 – 58.275	0.96 0.912 - 1.008	/
	Measurement value **2018-03-31**	2.14	1.29	55.225	0.974	**22.05**
900MHz	Recommended value	2.725 2.4525 – 2.9975	1.7475 1.57275-1.92225	55.0 52.25 – 57.75	1.05 0.9975-1.1025	/
	Measurement value **2018-03-29**	2.69	1.68	55.13	1.079	**22.11**
1800MHz	Recommended value	9.6 8.64 – 10.56	5.025 4.5225 – 5.5275	53.3 50.635 – 55.965	1.52 1.444-1.596	/
	Measurement value **2018-03-27**	9.99	5.29	53.271	1.54	**22.01**
2600MHz	Recommended value	13.825 12.4425–15.2075	6.15 5.535 – 6.765	52.5 49.875 – 55.125	2.16 2.052 – 2.268	/
	Measurement value **2018-03-30**	13.58	6.14	52.127	2.20	**22.01**

Frequency	Description	SAR(W/kg) (±10 window)		Dielectric Parameters (±5% window)		Temp
		1g	10g	εr	σ(s/m)	℃
2450MHz	Recommended value	13.1 11.79 - 14.41	6.00 5.40 - 6.60	52.7 50.065 – 55.335	1.95 1.8525 – 2.0475	/
	Measurement value **2018-08-11**	12.65	5.94	52.41	1.949	**22.11**
5250MHz	Recommended value	19.125 17.2125-21.0375	5.4 4.86 - 5.94	49.0 46.55 – 51.45	5.3 5.035 – 5.565	/
	Measurement value **2018-08-11**	18.55	5.49	47.601	5.411	**22.05**
5800MHz	Recommended value	19.5 17.55 - 21.45	5.475 4.9275 - 6.0225	48.2 45.79 – 50.61	6.0 5.70 – 6.30	/
	Measurement value **2018-08-11**	18.28	5.13	47.87	5.997	**22.05**
750MHz	Recommended value	2.1225 1.91025–2.33475	1.3875 1.24875–1.52625	55.5 52.725 – 58.275	0.96 0.912 - 1.008	/
	Measurement value **2018-08-11**	2.06	1.33	55.225	0.974	**22.05**
900MHz	Recommended value	2.725 2.4525 – 2.9975	1.7475 1.57275-1.92225	55.0 52.25 – 57.75	1.05 0.9975-1.1025	/
	Measurement value **2018-08-11**	2.71	1.66	55.13	1.079	**22.11**
1800MHz	Recommended value	9.6 8.64 – 10.56	5.025 4.5225 – 5.5275	53.3 50.635 – 55.965	1.52 1.444-1.596	/
	Measurement value **2018-08-11**	8.82	4.81	53.271	1.54	**22.01**
2600MHz	Recommended value	13.825 12.4425–15.2075	6.15 5.535 – 6.765	52.5 49.875 – 55.125	2.16 2.052 – 2.268	/
	Measurement value **2018-08-11**	14.25	6.49	52.127	2.20	**22.01**

Note: Recommended Values used derive from the calibration certificate and 250 mW is used as feeding power to the calibrated dipole.

7.3.Test Results

WIFI 2.4GHz:

Band	Channel	Test Position	Output Power		Measured Results		Scaled-1		Scaled-Final		Power Drift (dBm)
			Max. Scaled AV Power (dBm)	Measured AV Power (dBm)	SAR1g (W/kg)	SAR10g (W/kg)	SAR1g (W/kg)	SAR10g (W/kg)	SAR1g (W/kg)	SAR10g (W/kg)	
2.4G	11	Front	18.00	17.88	0.644	0.496	0.662	0.510	0.662	0.510	-0.14
		Back			0.109	0.048	0.112	0.049	0.112	0.049	0.10
		Left			0.126	0.059	0.130	0.061	0.130	0.061	0.06
		Top			0.441	0.187	0.453	0.192	0.454	0.192	0.13
		Bottom			0.325	0.152	0.334	0.156	0.334	0.156	0.12
		Head 15 Degree Left-**Left side**			0.121	0.060	0.124	0.062	0.124	0.062	-0.13
		Head 15 Degree Right-**Left side**			0.064	0.034	0.066	0.035	0.066	0.035	0.14
		Head Touch Left-**Left side**			0.125	0.064	0.129	0.066	0.129	0.066	-0.14
		Head Touch Right-**Left side**			0.068	0.036	0.070	0.037	0.070	0.037	-0.12
		Head Touch Left-**Right side**			0.108	0.054	0.111	0.056	0.111	0.056	-0.05
		Head Touch Right-**Right Side**			0.053	0.026	0.054	0.027	0.054	0.027	0.19
		Head 15 Degree Right-**Right side**			0.060	0.026	0.062	0.027	0.062	0.027	0.10
		Head 15 Degree Left-**Right side**			0.120	0.056	0.123	0.058	0.123	0.058	0.12
Conclusion: PASS											
Note : Factor= Max. Scaled AV Power(W)/Measured Power(W) Scaled SAR-1= Measured SAR*Factor Scaled-Final= Scaled SAR-1*(1/Duty Cycle) The Max.Reported SAR : 0.662**W/kg for 1g SAR**											

Notes: 1. Because the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, so the OFDM SAR for 11g/n mode can be exempted.

2.11b CH11 has the maximum output power so the SAR test was performed with this channel, and the Max scaled SAR less than 0.8W/Kg. so other channel can be excluded.

3.The WIFI 2.4GHz Duty Cycle is 100%.

4.The test value for some side are very lower than other side，and do not put the test plot in the report.

WIFI 5GHz:

Band	Channel	Test Position	Output Power		Measured Results		Scaled-1		Scaled-Final		Power Drift (dBm)
			Max. Scaled AV Power (dBm)	Measured AV Power (dBm)	SAR1g (W/kg)	SAR10g (W/kg)	SAR1g (W/kg)	SAR10g (W/kg)	SAR1g (W/kg)	SAR10g (W/kg)	
1	40	Front	13.50	13.40	0.603	0.301	0.617	0.308	0.617	0.308	0.08
		Back			0.329	0.108	0.337	0.111	0.337	0.111	0.10
		Left			0.730	0.248	0.747	0.254	0.747	0.254	-0.05
		Top			0.211	0.075	0.216	0.077	0.216	0.077	0.12
		Bottom			0.196	0.068	0.201	0.070	0.201	0.070	0.12
		Head 15 Degree Left-**Left side**			0.191	0.075	0.195	0.077	0.195	0.077	0.10
		Head 15 Degree Right-**Left side**			0.067	0.037	0.069	0.038	0.069	0.038	-0.02
		Head Touch Left-**Left side**			0.203	0.078	0.208	0.080	0.208	0.080	0.06
		Head Touch Right-**Left side**			0.072	0.036	0.074	0.037	0.074	0.037	0.14
		Head Touch Left-**Right side**			0.185	0.074	0.189	0.076	0.189	0.076	0.09
		Head Touch Right-**Right side**			0.069	0.035	0.071	0.036	0.071	0.036	0.11
		Head 15 Degree Left-**Right side**			0.095	0.026	0.097	0.027	0.097	0.027	0.02
		Head 15 Degree Right-**Right side**			0.032	0.012	0.033	0.0123	0.033	0.0123	0.06
4	157	Front	14.50	14.07	0.416	0.135	0.459	0.149	0.459	0.149	0.14
		Back			0.256	0.109	0.283	0.120	0.283	0.120	0.09
		Left			0.556	0.172	0.614	0.190	0.614	0.190	0.11
		Top			0.139	0.051	0.153	0.056	0.153	0.056	0.14
		Bottom			0.106	0.034	0.117	0.038	0.117	0.038	0.10
		Head 15 Degree Left-**Left side**			0.253	0.114	0.279	0.126	0.279	0.126	0.18
		Head 15 Degree Right-**Left side**			0.088	0.041	0.097	0.045	0.097	0.045	0.09
		Head Touch Left-**Left side**			0.279	0.107	0.308	0.118	0.308	0.118	0.19
		Head Touch Right-**Left side**			0.092	0.046	0.102	0.051	0.102	0.051	0.13
		Head Touch Left-**Right side**			0.272	0.101	0.300	0.112	0.300	0.112	0.05
		Head Touch Right-**Right side**			0.087	0.036	0.096	0.040	0.096	0.040	0.14
		Head 15 Degree Left-**Right side**			0.120	0.038	0.132	0.042	0.132	0.042	0.12
		Head 15 Degree Right-**Right side**			0.042	0.012	0.046	0.013	0.046	0.013	0.20
Conclusion: PASS											
Note : Factor= Max. Scaled AV Power(W)/Measured Power(W) Scaled SAR-1= Measured SAR*Factor Scaled-Final= Scaled SAR-1*(1/Duty Cycle) The Max.Reported SAR : 0.747**W/kg for 1g SAR**											

Notes: 1. The initial test configuration for 2.4 GHz and 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units,11a mode has the maximum output power compared with 11n/ac. So use 11a as the initial SAR test configuration mode.

2. Choose the channel which has the maximum output power for the SAR test, and if the Max scaled SAR less than 0.8W/Kg. other channel can be excluded.

3.The WIFI 5GHz Duty Cycle is 100%.

4.The test value for some side are very lower than other side，and do not put the test plot in the report

GSM:

GSM	Channel	Test Position	Output Power		Measured Results		Scaled-1		Scaled-Final		Power Drift (dBm)
			Max. Scaled AV Power (dBm)	Measured AV Power (dBm)	SAR1g (W/kg)	SAR10g (W/kg)	SAR1g (W/kg)	SAR10g (W/kg)	SAR1g (W/kg)	SAR10g (W/kg)	
850	128	Front	34.00	33.50	0.237	0.122	0.266	0.137	0.266	0.137	0.17
		Back			0.105	0.092	0.118	0.103	0.118	0.103	0.12
		Right			0.190	0.063	0.213	0.071	0.213	0.071	0.15
		Top			0.038	0.021	0.043	0.024	0.043	0.024	-0.10
		Bottom			0.034	0.018	0.038	0.020	0.038	0.020	0.10
		Head 15 Degree Left-**Left side**			0.020	0.018	0.022	0.020	0.022	0.020	0.17
		Head 15 Degree Right **-Left side**			0.034	0.027	0.038	0.030	0.038	0.030	0.16
		Head Touch Left-**Left side**			0.020	0.018	0.022	0.020	0.022	0.020	-0.20
		Head Touch Right-**Left Side**			0.035	0.028	0.039	0.031	0.039	0.031	0.03
		Head Touch Left-**Right Side**			0.016	0.014	0.018	0.016	0.018	0.016	-0.05
		Head Touch Right-**Right Side**			0.025	0.018	0.028	0.020	0.028	0.020	-0.02
		Head 15 Degree Left-**Right side**			0.012	0.008	0.013	0.009	0.013	0.009	-0.02
		Head 15 Degree Right **-Right side**			0.010	0.006	0.011	0.007	0.011	0.007	0.02
1900	512	Front	30.00	29.60	0.041	0.018	0.045	0.020	0.045	0.020	-0.12
		Back			0.024	0.010	0.026	0.011	0.026	0.011	0.10
		Right			0.032	0.015	0.035	0.016	0.035	0.016	0.04
		Top			0.015	0.00685	0.016	0.008	0.016	0.008	0.04
		Bottom			0.012	0.00426	0.013	0.005	0.013	0.005	0.05
		Head 15 Degree Left-**Left side**			0.00214	0.00146	0.002	0.002	0.002	0.002	0.06
		Head 15 Degree Right-**Left side**			0.00904	0.00508	0.010	0.006	0.010	0.006	0.08
		Head Touch Left-**Left side**			0.00246	0.00185	0.003	0.002	0.003	0.002	0.05
		Head Touch Right-**Left side**			0.00916	0.00586	0.010	0.006	0.010	0.006	-0.12
		Head Touch Left-**Right side**			0.00195	0.00155	0.002	0.002	0.002	0.002	0.12
		Head Touch Right-**Right side**			0.00823	0.00531	0.009	0.006	0.009	0.006	-0.01
		Head 15 Degree Left-**Right side**			0.00150	0.0009	0.002	0.001	0.002	0.001	-0.20
		Head 15 Degree Right-**Right side**			0.00621	0.00420	0.007	0.005	0.007	0.005	0.10

Conclusion: PASS

Note :
Factor= Max. Scaled AV Power(W)/Measured Power(W)
Scaled SAR-1= Measured SAR*Factor
Scaled-Final= Scaled SAR-1*(1/Duty Cycle)
The Max.Reported SAR : 0.266**W/kg for 1g SAR**

Notes: 1. TM1 mode has the higher output power compared with TM2 mode, so the SAR test was performed with TM1 Mode.

2. Choose the channel which has the max. output power for the SAR test, and the max. reported SAR less than 0.8W/kg, so other channels can be excluded.

WCDMA:

Band	Channel	Test Position	Output Power		Measured Results		Scaled-1		Scaled-Final		Power Drift (dBm)
			Max. Scaled AVPower (dBm)	Measured AV Power (dBm)	SAR1g (W/kg)	SAR10g (W/kg)	SAR1g (W/kg)	SAR10g (W/kg)	SAR1g (W/kg)	SAR10g (W/kg)	
2	9262	Front	27.00	26.67	0.723	0.476	0.780	0.514	0.780	0.514	-0.16
		Back			0.326	0.215	0.352	0.232	0.352	0.232	0.10
		Right			0.114	0.057	0.123	0.061	0.123	0.061	0.12
		Top			0.714	0.405	0.770	0.437	0.770	0.437	0.04
		Bottom			0.514	0.353	0.555	0.381	0.555	0.381	0.05
		Head 15 Degree Left-**Left side**			0.068	0.044	0.073	0.047	0.073	0.047	-0.09
		Head 15 Degree Right-**Left side**			0.071	0.047	0.077	0.051	0.077	0.051	-0.11
		Head Touch Left-**Left Side**			0.162	0.109	0.175	0.118	0.175	0.118	-0.18
		Head Touch Right-**Left Side**			0.632	0.378	0.682	0.408	0.682	0.408	0.11
		Head Touch Left-**Right side**			0.127	0.085	0.137	0.092	0.137	0.092	-0.14
		Head Touch Right-**Right Side**			0.419	0.216	0.452	0.233	0.452	0.233	-0.11
		Head 15 Degree Left-**Right side**			0.102	0.062	0.110	0.067	0.110	0.067	0.20
		Head 15 Degree Right-**Right side**			0.265	0.103	0.286	0.111	0.286	0.111	0.15
5	4132	Front	28.00	27.84	0.633	0.497	0.657	0.516	0.657	0.516	0.09
		Back			0.314	0.208	0.326	0.216	0.326	0.216	0.05
		Right			0.038	0.020	0.039	0.021	0.039	0.021	0.19
		Top			0.229	0.180	0.238	0.187	0.238	0.187	0.09
		Bottom			0.218	0.152	0.226	0.158	0.226	0.158	0.20
		Head 15 Degree Left-**Left side**			0.00414	0.00383	0.004	0.004	0.004	0.004	0.20
		Head 15 Degree Right-**Left side**			0.035	0.023	0.036	0.024	0.036	0.024	0.05
		Head Touch Left-**Left side**			0.00481	0.00418	0.005	0.004	0.005	0.004	-0.09
		Head Touch Right-**Left side**			0.295	0.243	0.306	0.252	0.306	0.252	0.12
		Head Touch Left-**right side**			0.00305	0.00170	0.003	0.002	0.003	0.002	-0.01
		Head Touch Right-**Right side**			0.216	0.112	0.224	0.116	0.224	0.116	-0.08
		Head 15 Degree Left-**Right side**			0.00120	0.00085	0.00125	0.00088	0.00125	0.00088	-0.15
		Head 15 Degree Right-**Right side**			0.104	0.068	0.108	0.071	0.108	0.071	0.20
Conclusion: PASS											
Note : Factor= Max. Scaled AV Power(W)/Measured Power(W) Scaled SAR-1= Measured SAR*Factor Scaled-Final= Scaled SAR-1*(1/Duty Cycle) The Max.Reported SAR : 0.780**W/kg for 1g SAR**											

Notes: 1. WCDMA has the higher output power compared with HSUPA, so the SAR test was performed with WCDMA Mode.

2. Choose the channel which has the max. output power for the SAR test, and the max. reported SAR less than 0.8W/kg, so other channels can be excluded.

LTE:

Band	Channel	Test Position	Output Power		Measured Results		Scaled-1		Scaled-Final		Power Drift (dBm)
			Max. Scaled AV Power (dBm)	Measured AV Power (dBm)	SAR1g (W/kg)	SAR10g (W/kg)	SAR1g (W/kg)	SAR10g (W/kg)	SAR1g (W/kg)	SAR10g (W/kg)	
2	18625	Front	23.00	22.90	0.652	0.537	0.667	0.550	0.667	0.550	0.05
		Back			0.369	0.241	0.378	0.247	0.378	0.247	0.10
		Right			0.577	0.304	0.590	0.311	0.590	0.311	-0.11
		Top			0.532	0.277	0.544	0.283	0.544	0.283	0.18
		Bottom			0.426	0.196	0.436	0.201	0.436	0.201	0.05
		Head 15 Degree Left-**Left side**			0.144	0.123	0.147	0.126	0.147	0.126	0.16
		Head 15 Degree Right-**Left side**			0.290	0.190	0.297	0.194	0.297	0.194	0.16
		Head Touch Left-**Left side**			0.155	0.097	0.159	0.099	0.159	0.099	-0.19
		Head Touch Right-**Left side**			0.532	0.317	0.544	0.324	0.544	0.324	0.10
		Head Touch Left-**Right side**			0.129	0.083	0.132	0.085	0.132	0.085	0.02
		Head Touch Right-**Right side**			0.522	0.270	0.534	0.276	0.534	0.276	-0.02
		Head 15 Degree Left-**Right side**			0.098	0.026	0.100	0.027	0.100	0.027	0.02
		Head 15 Degree Right-**Right side**			0.221	0.065	0.226	0.067	0.226	0.067	-0.10
4	20175	Front	23.50	23.2	0.668	0.525	0.716	0.563	0.716	0.563	0.08
		Back			0.328	0.246	0.351	0.264	0.351	0.264	0.05
		Right			0.571	0.315	0.612	0.338	0.612	0.338	-0.13
		Top			0.530	0.283	0.568	0.303	0.568	0.303	0.14
		Bottom			0.475	0.204	0.509	0.219	0.509	0.219	0.10
		Head 15 Degree Left-**Left side**			0.188	0.144	0.201	0.154	0.201	0.154	0.17
		Head 15 Degree Right-**Left side**			0.257	0.168	0.275	0.180	0.275	0.180	0.10
		Head Touch Left-**Left side**			0.195	0.136	0.209	0.146	0.209	0.146	0.04
		Head Touch Right-**Left side**			0.487	0.298	0.522	0.319	0.522	0.319	0.19
		Head Touch Left-**Right side**			0.167	0.129	0.179	0.138	0.179	0.138	-0.03
		Head Touch Right-**Right side**			0.415	0.234	0.445	0.251	0.445	0.251	-0.06
		Head 15 Degree Left-**Right side**			0.086	0.026	0.092	0.028	0.092	0.028	0.02
		Head 15 Degree Right-**Right side**			0.122	0.108	0.131	0.116	0.131	0.116	-0.12
5	20525	Front	24.00	23.50	0.647	0.371	0.726	0.416	0.726	0.416	0.08
		Back			0.426	0.248	0.478	0.278	0.478	0.278	0.05
		Right			0.096	0.050	0.108	0.056	0.108	0.056	-0.19
		Top			0.178	0.140	0.200	0.157	0.200	0.157	-0.08
		Bottom			0.168	0.123	0.188	0.138	0.188	0.138	0.10
		Head 15 Degree Left-**Left side**			0.191	0.172	0.214	0.193	0.214	0.193	0.17
		Head 15 Degree Right-**Left side**			0.192	0.180	0.215	0.202	0.215	0.202	0.04
		Head Touch Left-**Left side**			0.239	0.214	0.268	0.240	0.268	0.240	0.18
		Head Touch Right-**Left side**			0.238	0.196	0.267	0.220	0.267	0.220	0.10
		Head Touch Left-**Right side**			0.224	0.210	0.251	0.236	0.251	0.236	-0.04
		Head Touch Right-**Right side**			0.221	0.174	0.248	0.195	0.248	0.195	0.01
		Head 15 Degree Left-**Right side**			0.108	0.052	0.121	0.058	0.121	0.058	0.02
		Head 15 Degree Right-**Right side**			0.106	0.046	0.119	0.052	0.119	0.052	-0.12

12	23095	Front	24.00	23.50	0.072	0.043	0.081	0.048	0.081	0.048	0.04
		Back			0.042	0.026	0.047	0.029	0.047	0.029	0.05
		Right			0.029	0.019	0.033	0.021	0.033	0.021	0.00
		Top			0.018	0.015	0.020	0.017	0.020	0.017	0.19
		Bottom			0.016	0.012	0.018	0.013	0.018	0.013	0.10
		Head 15 Degree Left-**Left side**			0.00914	0.00798	0.010	0.009	0.010	0.009	0.07
		Head 15 Degree Right-**Left side**			0.174	0.164	0.195	0.184	0.195	0.184	0.14
		Head Touch Left-**Left side**			0.00974	0.00899	0.011	0.010	0.011	0.010	0.17
		Head Touch Right-**Left side**			0.223	0.182	0.250	0.204	0.250	0.204	0.06
		Head Touch Left-**Right side**			0.0093	0.00817	0.010	0.009	0.010	0.009	-0.09
		Head Touch Right-**Right side**			0.219	0.172	0.246	0.193	0.246	0.193	-0.19
		Head 15 Degree Left-**Right side**			0.0042	0.00201	0.0047	0.0022	0.0047	0.0022	-0.12
		Head 15 Degree Right-**Right side**			0.104	0.083	0.117	0.093	0.117	0.093	0.02
41	40265	Front	24.00	23.5	0.678	0.552	0.761	0.619	0.761	0.619	0.14
		Back			0.352	0.295	0.395	0.331	0.395	0.331	0.12
		Right			0.261	0.114	0.293	0.128	0.293	0.128	0.19
		Top			0.306	0.158	0.343	0.177	0.343	0.177	-0.14
		Bottom			0.304	0.124	0.341	0.139	0.341	0.139	0.12
		Head 15 Degree Left-**Left side**			0.128	0.070	0.144	0.079	0.144	0.079	0.17
		Head 15 Degree Right-**Left side**			0.363	0.232	0.407	0.260	0.407	0.260	0.17
		Head Touch Left-**Left side**			0.142	0.080	0.159	0.090	0.159	0.090	0.15
		Head Touch Right-**Left side**			0.601	0.508	0.674	0.570	0.674	0.570	0.07
		Head Touch Left-**Right side**			0.143	0.079	0.160	0.089	0.160	0.089	0.08
		Head Touch Right-**Right side**			0.530	0.228	0.595	0.256	0.595	0.256	0.11
		Head 15 Degree Left-**Right side**			0.098	0.024	0.110	0.027	0.110	0.027	0.05
		Head 15 Degree Right-**Right side**			0.215	0.102	0.241	0.114	0.241	0.114	0.12

Conclusion: PASS

Note :
Factor= Max. Scaled AV Power(W)/Measured Power(W)
Scaled SAR-1= Measured SAR*Factor
Scaled-Final= Scaled SAR-1*(1/Duty Cycle)
The Max. Reported SAR : 0.761**W/kg for 1g SAR**

Notes: 1. The output power in other modulation is not > ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is less than 1.45 W/kg, so other modulation can be excluded.

2. Start with the largest channel bandwidth then measure SAR for QPSK with 1 RB allocation, Choose the cannel which has the max. output power for the SAR test, and the max. reported SAR less than 0.8W/kg, so other channels can be excluded.

3. For QPSK with 50% and100% RB allocation, SAR is not required when the highest maximum output power is less than the highest maximum output power in 1 RB allocations, and the highest reported SAR for 1 RB is≤ 0.8 W/kg

7.4.Simultaneously SAR Evaluation

Per KDB 447498 Section 4.3.2(b), When an antenna qualifies for the standalone SAR test exclusion and also transmits simultaneously with other antennas, the standalone SAR value must be estimated according to the following to determine the simultaneous transmission SAR test exclusion criteria:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)/x] W/kg, for test separation distances ≤ 50 mm;

where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.

Regard with Bluetooth, The max. power of channel, including tune-up tolerance is 6dBm(3.98mW), the min. test separation distance is 5mm.f=2.48GHz,so

The standalone SAR value=3.98mW/5mm*√2.48/7.5=0.167W/kg for 1g SAR.

Max Reported SAR		Sum.SAR
WiFi 2.4GHz 0.662W/kg	GSM 0.266W/kg	0.928W/kg
	WCDMA 0.780W/kg	**1.442W/kg**
	LTE 0.761W/kg	1.423W/kg

Max Reported SAR		Sum.SAR
WiFi 5GHz 0.747W/kg	GSM 0.266W/kg	1.013W/kg
	WCDMA 0.780W/kg	**1.527W/kg**
	LTE 0.761W/kg	1.508W/kg

Max Reported SAR		Sum.SAR
Bluetooth 0.167W/kg	GSM 0.266W/kg	0.433 /kg
	WCDMA 0.780W/kg	**0.947W/kg**
	LTE 0.761W/kg	0.928W/kg

Since the Max Sum.SAR 1.527W/kg, which less than the FCC limit 1.6W/kg, so the SAR Evaluation for Simultaneously transmit can be exempted.

7.5.Dielectric Performance for Body Tissue simulating liquid

Frequency	Description	Dielectric Parameters (±5% window)		Temp
		Er	σ(s/m)	℃
2450MHz	Recommended value	52.7 50.065 – 55.335	1.95 1.8525 – 2.0475	/
	Measurement value **2018-03-29**	52.41	1.949	**22.11**
5200MHz	Recommended value	49.0 46.55 – 51.45	5.3 5.035 – 5.565	/
	Measurement value **2018-03-25**	47.601	5.411	**22.05**
5800MHz	Recommended value	48.2 45.79 – 50.61	6.0 5.70 – 6.30	/
	Measurement value **2018-03-25**	47.87	5.997	**22.05**
750MHz	Recommended value	55.5 52.725 – 58.275	0.96 0.912 - 1.008	/
	Measurement value **2018-03-31**	55.225	0.974	**22.05**
900MHz	Recommended value	55.0 52.25 – 57.75	1.05 0.9975-1.1025	/
	Measurement value **2018-03-29**	55.13	1.079	**22.11**
1800MHz	Recommended value	53.3 50.635 – 55.965	1.52 1.444-1.596	/
	Measurement value **2018-03-27**	53.271	1.54	**22.01**
2600MHz	Recommended value	52.5 49.875 – 55.125	2.16 2.052 – 2.268	/
	Measurement value **2018-03-30**	52.127	2.20	**22.01**

Frequency	Description	Dielectric Parameters (±5% window)		Temp
		Er	σ(s/m)	℃
2450MHz	Recommended value	52.7 50.065 – 55.335	1.95 1.8525 – 2.0475	/
	Measurement value **2018-08-11**	52.42	1.949	**22.11**
5200MHz	Recommended value	49.0 46.55 – 51.45	5.3 5.035 – 5.565	/
	Measurement value **2018-08-11**	47.603	5.420	**22.05**
5800MHz	Recommended value	48.2 45.79 – 50.61	6.0 5.70 – 6.30	/
	Measurement value **2018-08-11**	47.90	5.60	**22.05**
750MHz	Recommended value	55.5 52.725 – 58.275	0.96 0.912 - 1.008	/
	Measurement value **2018-08-11**	55.230	0.982	**22.05**
900MHz	Recommended value	55.0 52.25 – 57.75	1.05 0.9975-1.1025	/
	Measurement value **2018-08-11**	55.23	1.076	**22.11**
1800MHz	Recommended value	53.3 50.635 – 55.965	1.52 1.444-1.596	/
	Measurement value **2018-08-11**	53.281	1.56	**22.01**
2600MHz	Recommended value	52.5 49.875 – 55.125	2.16 2.052 – 2.268	/
	Measurement value **2018-08-11**	52.126	2.30	**22.01**

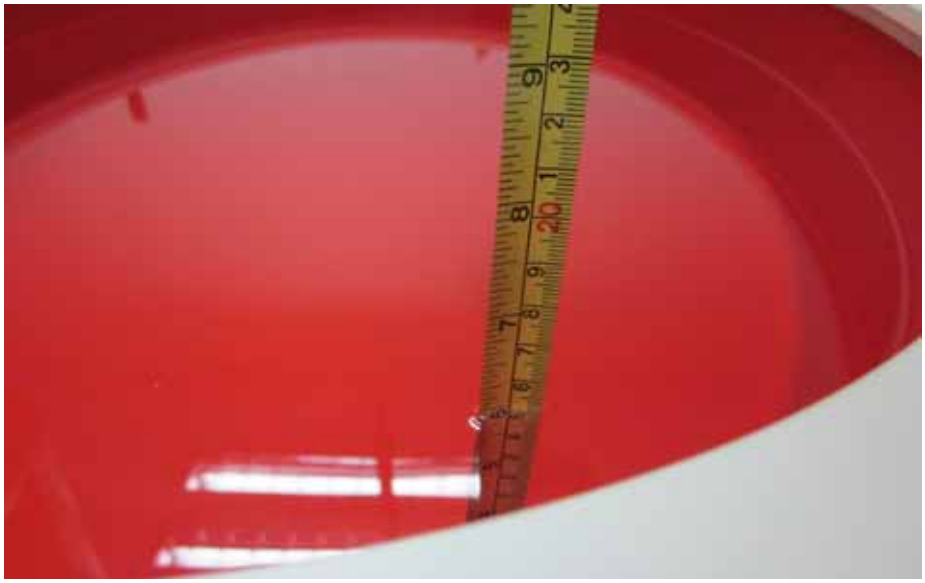


Figure 4.4: Liquid depth in the Flat Phantom