FCC SAR Test Report

APPLICANT	:	CASTLES TECHNOLOGY CO., LTD.
EQUIPMENT	:	POS Terminal
BRAND NAME	:	CASTLES TECHNOLOGY
MODEL NAME	:	S1F4
FCC ID	:	WIYS1F4001
STANDARD	:	FCC 47 CFR Part 2 (2.1093)

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Si Zhang

Approved by: Si Zhang

ilac-MRA ACCREDITED Cert #5145.02

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA520601	Rev. 01	Initial issue of report	Jun. 03, 2025

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **CASTLES TECHNOLOGY CO., LTD., POS Terminal, S1F4,** are as follows.

Highest 1g SAR Summary				
Equipment Class	Frequency Band		Body-worn (Separation 10mm) 1g SAR (W/kg)	Highest Simultaneous Transmission 1g SAR (W/kg)
Licensed	GSM	GSM850	0.21	0.58
		GSM1900	0.25	
	WCDMA	Band II	0.36	
		Band IV	0.43	
		Band V	0.36	
	LTE	LTE Band 7	0.42	
		LTE Band 12/17	0.25	
		LTE Band 25/2	0.30	
		LTE Band 26/5	0.28	
		LTE Band 66/4	0.30	
		LTE Band 41/38	**0.50**	
DTS	WLAN	2.4GHz WLAN	<0.10	0.56
NII		5GHz WLAN	<0.10	0.58
DSS	Bluetooth	2.4GHz Bluetooth	<0.10	0.50

Highest 10g SAR Summary				
Equipment Class	Frequency Band		Extremity (W/kg) (Separation 0mm)	Highest Simultaneous Transmission 10g SAR (W/kg)
Licensed	GSM	GSM850	1.50	3.15
		GSM1900	2.89	
	WCDMA	Band II	3.04	
		Band IV	3.07	
		Band V	0.83	
	LTE	LTE Band 7	2.75	
		LTE Band 12/17	1.12	
		LTE Band 25/2	**3.15**	
		LTE Band 26/5	0.70	
		LTE Band 66/4	2.95	
		LTE Band 41/38	2.85	
DTS	WLAN	2.4GHz WLAN	1.35	3.15
NII		5GHz WLAN	0.92	3.15
DSS	Bluetooth	2.4GHz Bluetooth	0.32	3.15
Date of Testing:			2025/3/3 ~ 2025/5/13	

Remark: This device supports LTE B2 / B5 / B4 / B17 / B38 and B25 / B26 / B66 / B12 / B41. Since the supported frequency span for LTE B2 / B5 /B4 / B17 / B38 falls completely within the supports frequency span for LTE B25 / B26 / B66 / B12 / B41, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was only assessed for LTE B25 / B26 / B66 / B12 / B41.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR, 4.0 W/kg for Product Specific 10g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

2. Administration Data

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	SAR02-KS, SAR07-KS	CN1257	314309

Applicant	
Company Name	CASTLES TECHNOLOGY CO., LTD.
Address	6F, NO. 207-5, SEC. 3, BEIXIN RD., XINDIAN DISTRICT, NEW TAIPEI CITY 231030, TAIWAN (R.O.C.)

Manufacturer	
Company Name	CASTLES TECHNOLOGY CO., LTD.
Address	6F, NO. 207-5, SEC. 3, BEIXIN RD., XINDIAN DISTRICT, NEW TAIPEI CITY 231030, TAIWAN (R.O.C.)

3. Guidance Applied

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

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	POS Terminal
Brand Name	CASTLES TECHNOLOGY
Model Name	S1F4
FCC ID	WIYS1F4001
IMEI Code	IMEI1:350512260007844 IMEI2:350512260007851
Wireless Technology and Frequency Range	GSM850: 824 MHz ~ 849 MHz GSM1900: 1850 MHz ~ 1910 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2535 MHz ~ 2655 MHz LTE Band 66: 1710 MHz ~ 1780 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	GPRS/EGPRS RMC 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+(16QAM uplink is supported) LTE: QPSK, 16QAM, 64QAM WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC:ASK
EUT Stage	Identical Prototype

Remark:
1. This device does not support voice function.
2. This device has no hotspot function.
3. The device implements Proximity sensors detect mechanism trigger reduced power for the power management for SAR compliance at different exposure conditions (body-worn, extremity). The device will invoke corresponding work scenarios power level, which are provided in the operational description.
4. NFC SAR report will be submitted separately.

4.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	WIYS1F4001
Equipment Name	POS Terminal
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2535 MHz ~ 2655 MHz LTE Band 66: 1710 MHz ~ 1780 MHz
Channel Bandwidth	LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 17: 5MHz, 10MHz LTE Band 25:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 66:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
Uplink Modulations used	QPSK / 16QAM / 64QAM
LTE Voice / Data requirements	Data only
LTE Release Version	R8
CA Support	Not Supported
LTE MPR permanently built-in by design	**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3**

Modulation	Channel bandwidth / Transmission bandwidth (N_{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
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
Power reduction applied to satisfy SAR compliance	Yes, when operating in Proximity sensors detect mechanism; body-worn /extremity will trigger reduced power for some bands applied to satisfy SAR compliance, the detail please referred to section 13.

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

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

LTE Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 5

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 7

	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 12

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711

LTE Band 17

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq. (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

LTE Band 25

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26047	1850.7	26055	1851.5	26065	1852.5	26090	1855	26115	1857.5	26140	1860
M	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880
H	26683	1914.3	26675	1913.5	26665	1912.5	26640	1910	26615	1907.5	26590	1905

LTE Band 26

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26697	814.7	26705	815.5	26715	816.5	26740	819	26765	821.5
M	26865	831.5	26865	831.5	26865	831.5	26865	831.5	26865	831.5
H	27033	848.3	27025	847.5	27015	846.5	26990	844	26965	841.5

LTE Band 38								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580
M	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610
LTE Band 41								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	40065	2537.5	40090	2540	40115	2542.5	40140	2545
LM	40385	2569.5	40390	2570	40395	2570.5	40400	2571
HM	40705	2601.5	40690	2600	40685	2599.5	40670	2598
H	41215	2652.5	41190	2650	41165	2647.5	41140	2645

LTE Band 66												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	131979	1710.7	131987	1711.5	131997	1712.5	132022	1715	132047	1717.5	132072	1720
M	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745
H	132665	1779.3	132657	1778.5	132647	1777.5	132622	1775	132597	1772.5	132572	1770

<For LTE Overlap Bands Description>

1) LTE Bands BW

Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
LTE Band 4	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 66	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 12	Yes	Yes	Yes	Yes		
LTE Band 17			Yes	Yes		
LTE Band 5	Yes	Yes	Yes	Yes		
LTE Band 26	Yes	Yes	Yes	Yes	Yes	
LTE Band 38			Yes	Yes	Yes	Yes
LTE Band 41			Yes	Yes	Yes	Yes
LTE Band 25	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 2	Yes	Yes	Yes	Yes	Yes	Yes

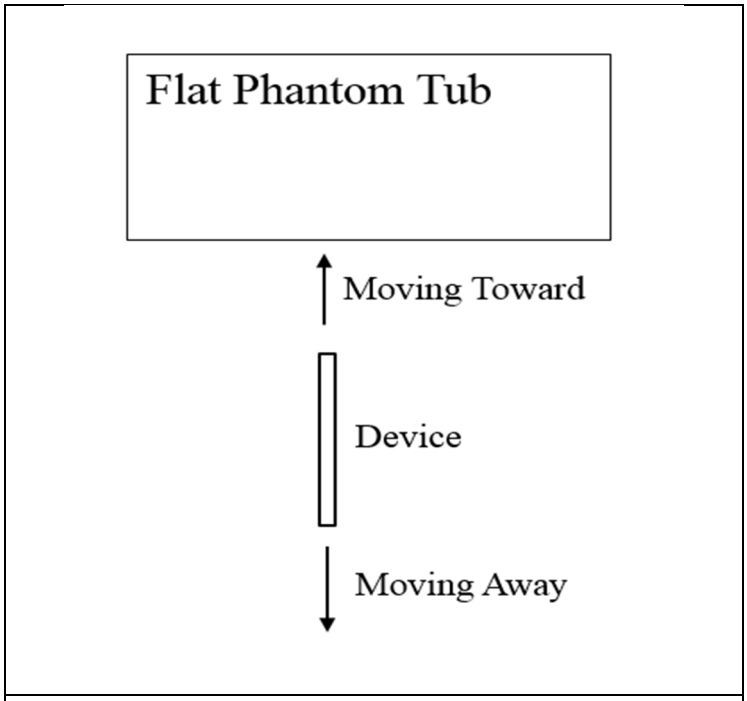
2) LTE Bands tune up:

Band	Antenna	Body worn& Extremity sensor on Tune-up Limit	Default Tune-up Limit
LTE Band 25(2)	Ant 0	22.5	24
LTE Band 66(4)	Ant 0	22.5	24
LTE Band 26(5)	Ant 0	24.5	24.5
LTE Band 12(17)	Ant 0	25	25
LTE Band 41(38)	Ant 0	23	24

5. Proximity Sensor Triggering Test

<Proximity Sensor Triggering Distance>:

1. Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed and the tissue-equivalent medium for highest frequency (2600MHz) and lowest (1750MHz) frequency was used for proximity sensor triggering testing.
2. Capacitive proximity sensors placed coincident with antenna elements at the right top ends of the device are utilized to determine when the device comes in proximity of the user's body or finger or hand at the right side of the device. There is no need to do sensor coverage testing for the proximity sensor is designed to support sufficient detection range and sensitivity to cover regions of the sensors in all applicable directions since the proximity sensor entirely covers the antenna.
3. The sensors can use to detect the proximity of the user's body or handheld states at the right side of the device use a detection threshold distance. When right sides of body or handheld condition is detected reduced power will be active. The trigger distance shown in the sections below.
4. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance -1mm was performed.



Handheld detection test set-up, Right Side

<Sensor for ANT 0>

Proximity Sensor Triggering Distance (mm)		
Position	Right Side	
	Moving towards	Moving away
Minimum	11	16

6. RF Exposure Limits

6.1 Uncontrolled Environment

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

6.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

7. Specific Absorption Rate (SAR)

7.1 Introduction

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

7.2 SAR Definition

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

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

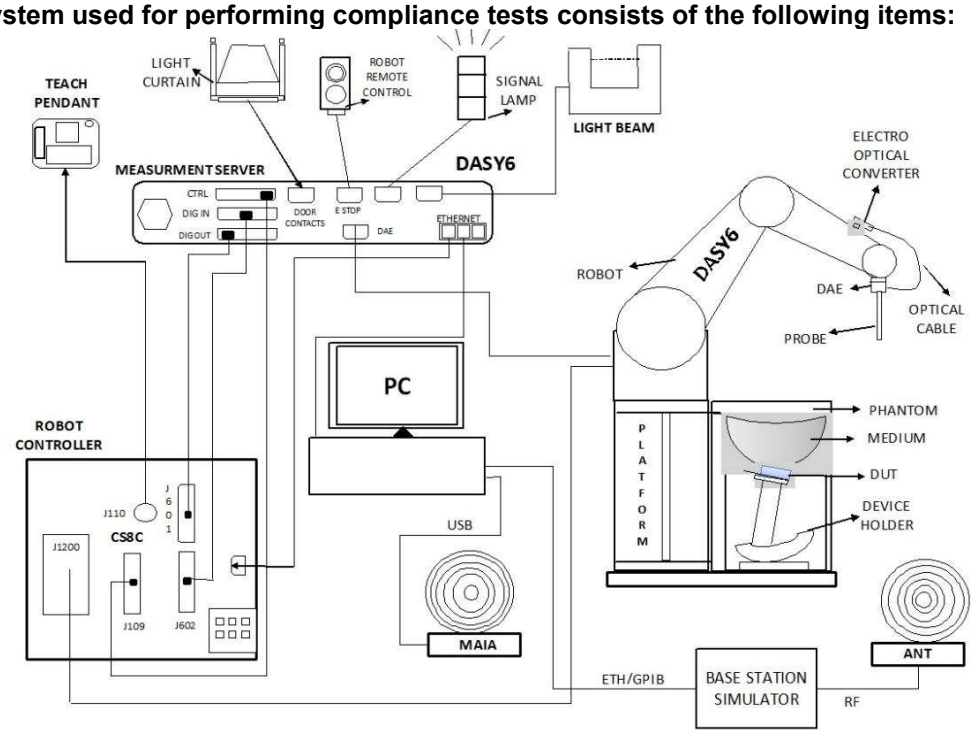
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

8. System Description and Setup

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 or Win10 and the DASY5 or DASY6 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

8.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	4 MHz – 10 GHz Linearity: ±0.2 dB (30 MHz – 10 GHz)
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 μW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 μW/g)
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	5 μW/g – >100 mW/g; Linearity: ±0.2 dB
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm

8.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Photo of DAE

8.3 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom

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. 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.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm

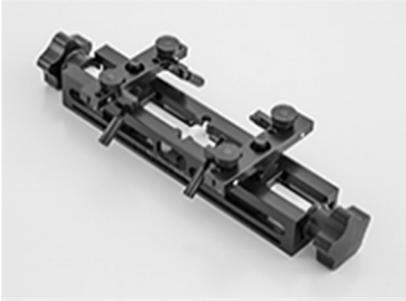
The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices or for evaluating transmitters operating at low frequencies. ELI is fully compatible with standard and all known tissue simulating liquids.

8.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

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

<SAR measurement>

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

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

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

9.1 Spatial Peak SAR Evaluation

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

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

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

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

9.2 Power Reference Measurement

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

9.3 Area Scan

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

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

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

9.4 Zoom Scan

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

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

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

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

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

9.5 Volume Scan Procedures

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

9.6 Power Drift Monitoring

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

10. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1099	2024/12/13	2025/12/12
SPEAG	835MHz System Validation Kit	D835V2	4d162	2024/12/13	2025/12/12
SPEAG	1750MHz System Validation Kit	D1750V2	1137	2024/10/15	2025/10/14
SPEAG	1900MHz System Validation Kit	D1900V2	5d182	2024/12/16	2025/12/15
SPEAG	2450MHz System Validation Kit	D2450V2	1095	2024/2/8	2026/2/6
SPEAG	2600MHz System Validation Kit	D2600V2	1112	2023/12/18	2025/12/16
SPEAG	5000MHz System Validation Kit	D5GHzV2	1113	2022/9/23	2025/9/21
SPEAG	Data Acquisition Electronics	DAE4	1279	2024/8/20	2025/8/19
SPEAG	Data Acquisition Electronics	DAE4	1650	2024/11/25	2025/11/24
SPEAG	Dosimetric E-Field Probe	EX3DV4	7764	2024/9/2	2025/9/1
SPEAG	Dosimetric E-Field Probe	EX3DV4	7729	2024/12/16	2025/12/15
SPEAG	Dosimetric E-Field Probe	ES3DV3	3282	2025/1/23	2026/1/22
SPEAG	SAM Twin Phantom	SAM Twin	TP-1842	NCR	NCR
SPEAG	SAM Twin Phantom	SAM Twin	TP-2024	NCR	NCR
CHIGO	Thermo-Hygrometer	HTC-1	1929539	2024/5/15	2025/5/14
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio Communication Analyzer	MT8821C	6262306175	2024/7/4	2025/7/3
Agilent	ENA Series Network Analyzer	E5071C	MY46112129	2024/7/4	2025/7/3
SPEAG	Dielectric Probe Kit	DAK-3.5	1144	2024/8/20	2025/8/19
Anritsu	Vector Signal Generator	MG3710A	6201682672	2025/1/3	2026/1/2
Rohde & Schwarz	Power Meter	NRVD	102081	2024/7/4	2025/7/3
Rohde & Schwarz	Power Sensor	NRV-Z5	100538	2024/7/4	2025/7/3
Rohde & Schwarz	Power Sensor	NRV-Z5	100539	2024/7/4	2025/7/3
R&S	BLUETOOTH TESTER	CBT	101246	2024/7/4	2025/7/3
Rohde & Schwarz	Spectrum Analyzer	FSV7	101631	2024/10/11	2025/10/10
TES	DIGITAC THERMOMETER	TYPE-K	220305411	2025/1/2	2026/1/1
ARRA	Power Divider	A3200-2	N/A	Note 1	
MCL	Attenuation1	BW-S10W5+	N/A	Note 1	
MCL	Attenuation2	BW-S10W5+	N/A	Note 1	
MCL	Attenuation3	BW-S10W5+	N/A	Note 1	
BONN	POWER AMPLIFIER	BLMA 0830-3	087193A	Note 1	
BONN	POWER AMPLIFIER	BLMA 2060-2	087193B	Note 1	
Agilent	Dual Directional Coupler	778D	20500	Note 1	
Agilent	Dual Directional Coupler	11691D	MY48151020	Note 1	

Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. The dipole calibration interval can be extended to 3 years with justification according to KDB 865664 D01. The dipoles are also not physically damaged, or repaired during the interval. The justification data in appendix C can be found which the return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration for each dipole.

11. System Verification

11.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1.

Fig 10.1 Photo of Liquid Height for Body SAR

11.2 Tissue Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
1750	Head	22.8	1.317	40.224	1.37	40.10	-3.87	0.31	±5	2025/3/5
1900	Head	22.8	1.407	40.215	1.40	40.00	0.50	0.54	±5	2025/3/6
2450	Head	22.9	1.744	39.267	1.80	39.20	-3.11	0.17	±5	2025/3/7
2600	Head	22.8	2.030	40.346	1.96	39.00	3.57	3.45	±5	2025/3/8
5250	Head	22.8	4.590	36.300	4.71	35.90	-2.55	1.11	±5	2025/3/12
5600	Head	22.8	4.950	35.800	5.07	35.50	-2.37	0.85	±5	2025/3/13
5750	Head	22.7	5.170	35.600	5.22	35.40	-0.96	0.56	±5	2025/3/14
750	Head	22.7	0.888	42.260	0.89	41.90	-0.22	0.86	±5	2025/3/3
835	Head	22.9	0.912	41.937	0.90	41.50	1.33	1.05	±5	2025/3/4
2450	Head	22.7	1.771	39.271	1.80	39.20	-1.89	-0.49	±5	2025/5/13

11.3 System Performance Check Results

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

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2025/3/5	1750	Head	50	1137	7764	1279	1.780	36.80	35.6	-3.26	0.948	19.60	18.96	-3.27
2025/3/6	1900	Head	50	5d182	7764	1279	1.970	39.80	39.4	-1.01	1.050	21.00	21	0.00
2025/3/7	2450	Head	50	1095	7764	1279	2.590	52.60	51.8	-1.52	1.220	24.70	24.4	-1.21
2025/3/8	2600	Head	50	1112	7764	1279	2.810	55.10	56.2	2.00	1.280	24.80	25.6	3.23
2025/3/12	5250	Head	50	1113	7729	1650	4.280	81.50	85.6	5.03	1.230	23.30	24.6	5.58
2025/3/13	5600	Head	50	1113	7729	1650	4.350	82.60	87	5.33	1.260	23.70	25.2	6.33
2025/3/14	5750	Head	50	1113	7729	1650	4.140	80.80	82.8	2.48	1.200	23.00	24	4.35
2025/3/3	750	Head	100	1099	7764	1279	0.818	8.28	8.18	-1.21	0.539	5.37	5.39	0.37
2025/3/4	835	Head	100	4d162	7764	1279	0.955	9.08	9.55	5.18	0.618	5.85	6.18	5.64
2025/5/13	2450	Head	50	1095	3282	1279	2.490	52.60	49.8	-5.32	1.160	24.70	23.2	-6.07

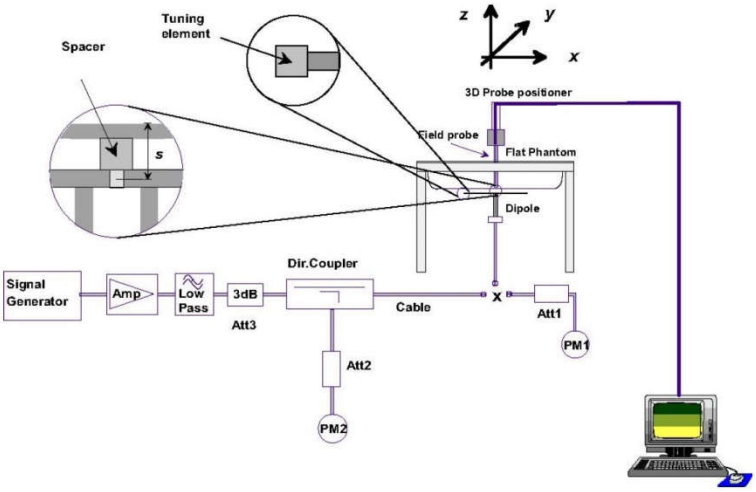


Fig 10.3.1 System Performance Check Setup

Fig 10.3.2 Setup Photo

12. RF Exposure Positions

12.1 Body-worn SAR Testing for Device

(a) To position the device parallel to the phantom surface with Front and Back surfaces of the device.

(b) To adjust the device parallel to the flat phantom.

(c) To adjust the distance between the device surface and the flat phantom to 10 mm.

12.2 Handheld SAR Testing for Device

(b) To position the device parallel to the phantom surface with all surfaces of the device.

(b) To adjust the device parallel to the flat phantom.

(c) To adjust the distance between the device surface and the flat phantom to 0 mm.

Please refer to Appendix D for the test setup photos.

13. Conducted RF Output Power (Unit: dBm)

The detailed conducted power table can refer to Appendix E.

<GSM Conducted Power>

General Note:

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, for SAR test reduction for GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.
3. Other configurations of GPRS / EDGE are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode.

<WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.
3. For HSPA+ devices supporting 16 QAM in the uplink, power measurements procedure is according to the configurations in Table C.11.1.4 of 3GPP TS 34.121-1.
4. For DC-HSDPA, the device was configured according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1, with the primary and the secondary serving HS-DSCH Cell enabled during the power measurement.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors (β_c and β_d) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Setup Configuration

HSUPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode= Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed}1$: 47/15 $\beta_{ed}2$: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c. For sub-test 5, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 5/15 with β_{hs} = 5/15 * β_c.

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.

Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

Setup Configuration

DC-HSDPA 3GPP release 8 Setup Configuration:

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

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

C.8.1.12 Fixed Reference Channel Definition H-Set 12

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

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

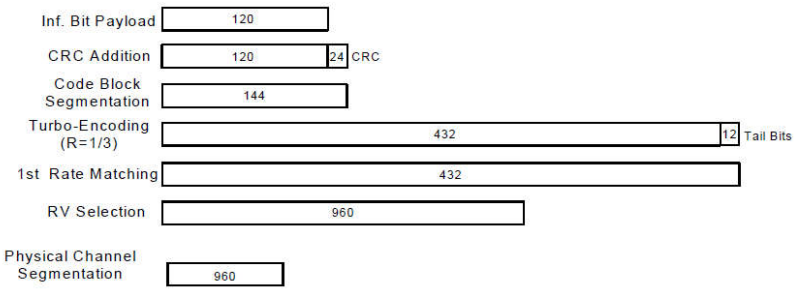


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

HSPA+ 3GPP release 7 (uplink category 7) 16QAM, Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2E:HSPA+:UL with 16QAM
   ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.4, quoted from the TS 34.121-1 s5.2E
   iii. Set Channel Parms
   iv. Set Cell Power = -86 dBm
   v. Set Channel Type = HSPA
   vi. Set UE Target Power =21 dBm
   vii. Power Ctrl Mode= All Up Bits
   viii. Set Manual Uplink DPCH Bc/Bd = Manual
   ix. Set Manual Uplink DPCH Bc and Bd=15,15(for 34.121-1 v8.10.0 table C11.1.4 sub-test 1)
   x. Set HSPA Conn DL Channel Levels
   xi. Set HS-SCCH Configs
   xii. Set RB Test Mode Setup
   xiii. Set Common HSUPA Parameters
   xiv. Set Serving Grant
   xv. Confirm that E-TFCI is equal to the target E-TFCI of 105 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

Table C.11.1.4: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	$\beta_{ed}1$: 30/15 $\beta_{ed}2$: 30/15	$\beta_{ed}3$: 24/15 $\beta_{ed}4$: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signaled to use the extrapolation algorithm.

Setup Configuration

<WCDMA Conducted Power>

General Note:

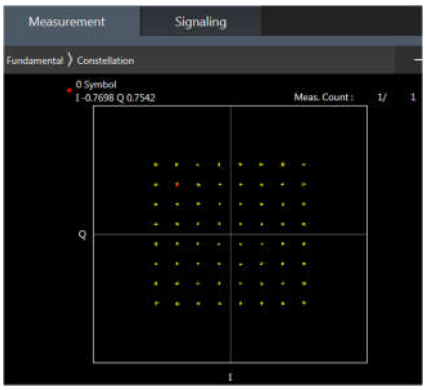
1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA / HSPA+ is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA / HSPA+ to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+, and according to the following RF output power, the output power results of the secondary modes (HSDPA / HSUPA / DC-HSDPA / HSPA+) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+.

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, 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.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, for QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM/64QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4 / B5 / B12 / B17 / B38 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
9. LTE band 2 / 5 /17 / 4 / 38 SAR test was covered by Band 25 / 26 /12 / 66 / 41; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band
10. According to May 2017 TCB workshop, for 16QAM and 64QAM should be verified by checking the signal constellation with a call box to avoid incorrect maximum power levels due to MPR and other requirements associated with signal modulation, and the following figure is taken from the "Fundamental Measurement >> Modulation Analysis >> constellation" mode of the device connect to the MT8821C base station, therefore, the device 64QAM and 16QAM signal modulation are correct.

16QAM



64QAM

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

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

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

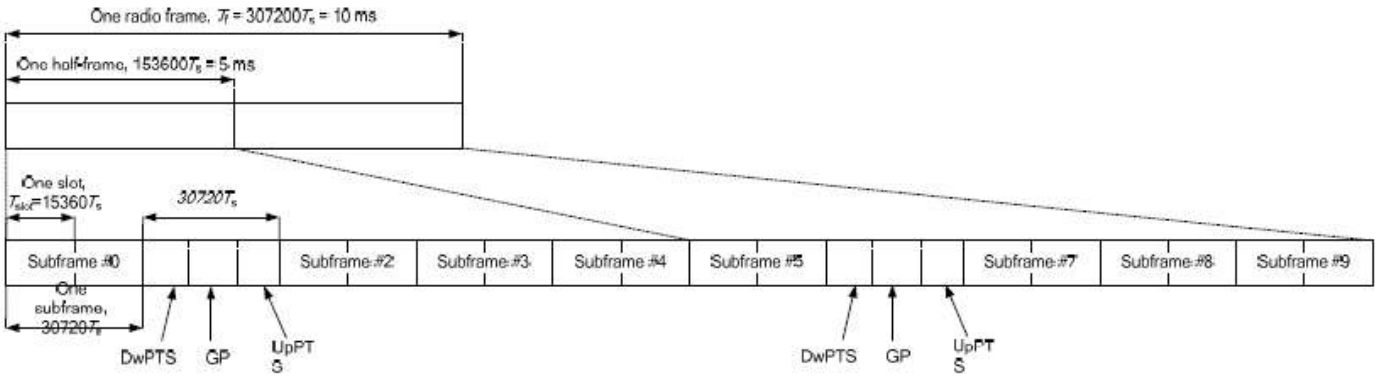


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

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

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

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

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

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

The highest duty factor is resulted from:

For LTE TDD Power class 3

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

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

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

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

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

<WLAN Conducted Power>

General Note:

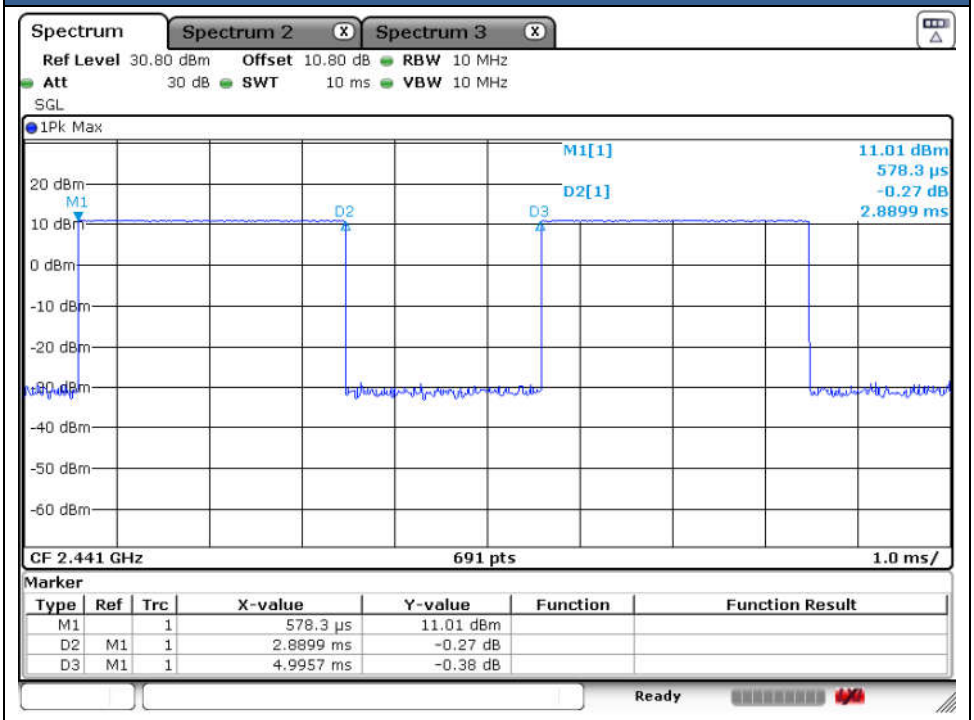
1. The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures. For “Not required”, SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration. Additional output power measurements were not necessary.
2. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
3. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
4. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
5. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
   a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
   b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
   c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

<2.4GHz Bluetooth>

General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The Bluetooth duty cycle are 57.85% as following figure, Bluetooth SAR scaling need further consideration and the theoretical duty cycle is 83.3%, therefore the actual duty cycle will be scaled up to the theoretical value of Bluetooth reported SAR calculation.

Bluetooth time-domain plot



14. Antenna Location

The detailed antenna location information can refer to SAR Test Setup Photos.

15. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For SAR testing of Bluetooth signal with 83.3% theoretical duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle) *83.3%".
   d. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   e. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
   f. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The Reported TDD LTE SAR (W/kg) = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
4. For 10-g extremity SAR testing, only performed within a transmitting antenna located within 25mm from that surface or edge.
5. While 1-g SAR thresholds are specified in the procedures for SAR test reduction and exclusion, these thresholds should be multiplied by 2.5 when 10-g extremity SAR is considered.

GSM Note:

1. Per KDB 941225 D01v03r01, for SAR test reduction for GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.
2. Other configurations of GPRS / EDGE are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode.

WCDMA Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA / HSPA+ is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA / HSPA+ to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+, and according to the following RF output power, the output power results of the secondary modes (HSDPA / HSUPA / DC-HSDPA / HSPA+) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+.

LTE Note:

1. Per KDB 941225 D05v02r05, 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.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, for QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM/64QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B4 / B5 / B12 / B17 / B38 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
7. LTE B 2 / 5 / 17 / 4 / 38 SAR test was covered by LTE B25 / 26 /12 / 66 / 41; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band

WLAN/Bluetooth Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing 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 ≤ 1.2 W/kg.
2. Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band.
3. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
4. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
5. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

15.1 Body Worn SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
750MHz																				
	LTE Band 12	10M	QPSK	1	0	-	Front	10mm	Ant 0	Full Power	23095	707.5	23.97	25.00	1.268	-	-	0.08	0.137	0.174
	LTE Band 12	10M	QPSK	25	0	-	Front	10mm	Ant 0	Full Power	23095	707.5	23.04	24.00	1.247	-	-	0.01	0.120	0.150
01	LTE Band 12	10M	QPSK	1	0	-	Back	10mm	Ant 0	Full Power	23095	707.5	23.97	25.00	1.268	-	-	0.02	0.200	**0.254**
	LTE Band 12	10M	QPSK	25	0	-	Back	10mm	Ant 0	Full Power	23095	707.5	23.04	24.00	1.247	-	-	0.03	0.171	0.213
835MHz																				
02	GSM850	-	-	-	-	GPRS (2 Tx slots)	Front	10mm	Ant 0	Full Power	189	836.4	30.84	32.00	1.306	-	-	-0.04	0.157	**0.205**
	GSM850	-	-	-	-	GPRS (2 Tx slots)	Back	10mm	Ant 0	Full Power	189	836.4	30.84	32.00	1.306	-	-	-0.08	0.129	0.168
03	WCDMA V	-	-	-	-	RMC 12.2Kbps	Front	10mm	Ant 0	Full Power	4182	836.4	23.17	24.00	1.211	-	-	-0.04	0.300	**0.363**
	WCDMA V	-	-	-	-	RMC 12.2Kbps	Back	10mm	Ant 0	Full Power	4182	836.4	23.17	24.00	1.211	-	-	-0.08	0.219	0.265
04	LTE Band 26	15M	QPSK	1	0	-	Front	10mm	Ant 0	Full Power	26865	831.5	23.78	24.50	1.180	-	-	0.1	0.238	**0.281**
	LTE Band 26	15M	QPSK	36	0	-	Front	10mm	Ant 0	Full Power	26865	831.5	22.74	23.50	1.191	-	-	-0.18	0.194	0.231
	LTE Band 26	15M	QPSK	1	0	-	Back	10mm	Ant 0	Full Power	26865	831.5	23.78	24.50	1.180	-	-	0.1	0.181	0.214
	LTE Band 26	15M	QPSK	36	0	-	Back	10mm	Ant 0	Full Power	26865	831.5	22.74	23.50	1.191	-	-	0.12	0.149	0.177
1750MHz																				
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Front	10mm	Ant 0	Full Power	1413	1732.6	22.94	24.00	1.276	-	-	-0.17	0.197	0.251
05	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Back	10mm	Ant 0	Full Power	1413	1732.6	22.94	24.00	1.276	-	-	0.02	0.340	**0.434**
	LTE Band 66	20M	QPSK	1	0	-	Front	10mm	Ant 0	Full Power	132322	1745	22.95	24.00	1.274	-	-	0.17	0.128	0.163
	LTE Band 66	20M	QPSK	50	0	-	Front	10mm	Ant 0	Full Power	132322	1745	22.26	23.00	1.186	-	-	0.18	0.109	0.129
06	LTE Band 66	20M	QPSK	1	0	-	Back	10mm	Ant 0	Full Power	132322	1745	22.95	24.00	1.274	-	-	0	0.237	**0.302**
	LTE Band 66	20M	QPSK	50	0	-	Back	10mm	Ant 0	Full Power	132322	1745	22.26	23.00	1.186	-	-	-0.04	0.201	0.238
1900MHz																				
	GSM1900	-	-	-	-	GPRS (4 Tx slots)	Front	10mm	Ant 0	Full Power	661	1880	24.27	25.50	1.327	-	-	-0.17	0.100	0.133
07	GSM1900	-	-	-	-	GPRS (4 Tx slots)	Back	10mm	Ant 0	Full Power	661	1880	24.27	25.50	1.327	-	-	0.08	0.188	**0.250**
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Front	10mm	Ant 0	Full Power	9400	1880	22.85	24.00	1.303	-	-	-0.03	0.143	0.186
08	WCDMA II	-	-	-	-	RMC 12.2Kbps	Back	10mm	Ant 0	Full Power	9400	1880	22.85	24.00	1.303	-	-	0.11	0.274	**0.357**
	LTE Band 25	20M	QPSK	1	0	-	Front	10mm	Ant 0	Full Power	26340	1880	22.97	24.00	1.268	-	-	-0.08	0.091	0.115
	LTE Band 25	20M	QPSK	50	0	-	Front	10mm	Ant 0	Full Power	26340	1880	22.06	23.00	1.242	-	-	-0.04	0.078	0.097
09	LTE Band 25	20M	QPSK	1	0	-	Back	10mm	Ant 0	Full Power	26340	1880	22.97	24.00	1.268	-	-	0.1	0.238	**0.302**
	LTE Band 25	20M	QPSK	50	0	-	Back	10mm	Ant 0	Full Power	26340	1880	22.06	23.00	1.242	-	-	-0.08	0.207	0.257
2600MHz																				
	LTE Band 7	20M	QPSK	1	0	-	Front	10mm	Ant 0	Full Power	21100	2535	22.98	24.00	1.265	-	-	0.14	0.103	0.130
	LTE Band 7	20M	QPSK	50	0	-	Front	10mm	Ant 0	Full Power	21100	2535	22.18	23.00	1.208	-	-	0.11	0.086	0.104
10	LTE Band 7	20M	QPSK	1	0	-	Back	10mm	Ant 0	Full Power	21100	2535	22.98	24.00	1.265	-	-	-0.03	0.328	**0.415**
	LTE Band 7	20M	QPSK	50	0	-	Back	10mm	Ant 0	Full Power	21100	2535	22.18	23.00	1.208	-	-	-0.05	0.275	0.332
	LTE Band 41	20M	QPSK	1	0	-	Front	10mm	Ant 0	Full Power	40140	2545	23.14	24.00	1.219	62.9	1.006	0.18	0.148	0.181
	LTE Band 41	20M	QPSK	50	0	-	Front	10mm	Ant 0	Full Power	40140	2545	22.15	23.00	1.216	62.9	1.006	0.14	0.122	0.149
11	LTE Band 41	20M	QPSK	1	0	-	Back	10mm	Ant 0	Full Power	40140	2545	23.14	24.00	1.219	62.9	1.006	0.09	0.407	**0.499**
	LTE Band 41	20M	QPSK	50	0	-	Back	10mm	Ant 0	Full Power	40140	2545	22.15	23.00	1.216	62.9	1.006	-0.17	0.338	0.414

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
2450MHz																
12	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	Ant 1	Full Power	11	2462	15.32	17.00	1.472	100	1.000	0.01	0.053	**0.077**
	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	Ant 1	Full Power	11	2462	15.32	17.00	1.472	100	1.000	0.1	0.041	0.060
	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	Ant 1	Full Power	1	2412	13.13	15.00	1.538	100	1.000	-0.18	0.040	0.062
	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	Ant 1	Full Power	6	2437	12.38	14.00	1.452	100	1.000	0.1	0.050	0.073
13	Bluetooth	1Mbps	Front	10mm	Ant 1	Full Power	39	2441	10.57	12.00	1.391	57.85	1.440	0.09	0.010	**0.020**
	Bluetooth	1Mbps	Back	10mm	Ant 1	Full Power	39	2441	10.57	12.00	1.391	57.85	1.440	-0.18	0.000	0.000
	Bluetooth	1Mbps	Front	10mm	Ant 1	Full Power	0	2402	10.13	12.00	1.539	57.85	1.440	0.03	0.007	0.016
	Bluetooth	1Mbps	Front	10mm	Ant 1	Full Power	78	2480	10.31	12.00	1.477	57.85	1.440	-0.15	0.005	0.011
5000MHz																
	WLAN5.3GHz	802.11a 6Mbps	Front	10mm	Ant 1	Full Power	64	5320	16.31	18.00	1.475	97.65	1.024	0.06	0.000	0.000
	WLAN5.3GHz	802.11a 6Mbps	Back	10mm	Ant 1	Full Power	64	5320	16.31	18.00	1.475	97.65	1.024	-0.08	0.043	0.065
	WLAN5.3GHz	802.11a 6Mbps	Back	10mm	Ant 1	Full Power	52	5260	16.11	17.50	1.376	97.65	1.024	-0.08	0.046	0.065
	WLAN5.3GHz	802.11a 6Mbps	Back	10mm	Ant 1	Full Power	56	5280	16.16	17.50	1.360	97.65	1.024	0.1	0.049	0.068
14	WLAN5.3GHz	802.11a 6Mbps	Back	10mm	Ant 1	Full Power	60	5300	16.13	17.50	1.370	97.65	1.024	-0.18	0.052	**0.073**
	WLAN5.5GHz	802.11a 6Mbps	Front	10mm	Ant 1	Full Power	100	5500	16.27	17.50	1.326	97.65	1.024	0.1	0.000	0.000
	WLAN5.5GHz	802.11a 6Mbps	Back	10mm	Ant 1	Full Power	100	5500	16.27	17.50	1.326	97.65	1.024	0.05	0.037	0.050
15	WLAN5.5GHz	802.11a 6Mbps	Back	10mm	Ant 1	Full Power	116	5580	16.05	17.50	1.395	97.65	1.024	0.08	0.052	**0.074**
	WLAN5.5GHz	802.11a 6Mbps	Back	10mm	Ant 1	Full Power	132	5660	16.13	17.50	1.370	97.65	1.024	-0.05	0.045	0.063
	WLAN5.5GHz	802.11a 6Mbps	Back	10mm	Ant 1	Full Power	140	5700	16.15	17.50	1.364	97.65	1.024	-0.03	0.039	0.054
	WLAN5.8GHz	802.11a 6Mbps	Front	10mm	Ant 1	Full Power	149	5745	16.18	17.50	1.354	97.65	1.024	0.11	0.048	0.067
16	WLAN5.8GHz	802.11a 6Mbps	Back	10mm	Ant 1	Full Power	149	5745	16.18	17.50	1.354	97.65	1.024	0.11	0.055	**0.076**
	WLAN5.8GHz	802.11a 6Mbps	Back	10mm	Ant 1	Full Power	157	5785	15.99	17.50	1.415	97.65	1.024	-0.05	0.036	0.052
	WLAN5.8GHz	802.11a 6Mbps	Back	10mm	Ant 1	Full Power	165	5825	15.95	17.50	1.428	97.65	1.024	0.18	0.046	0.067

15.2 Extremity SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
750MHz																				
	LTE Band 12	10M	QPSK	1	0	-	Front	0mm	Ant 0	Full Power	23095	707.5	23.97	25.00	1.268	-	-	0.1	0.220	0.279
	LTE Band 12	10M	QPSK	25	0	-	Front	0mm	Ant 0	Full Power	23095	707.5	23.04	24.00	1.247	-	-	-0.17	0.187	0.233
	LTE Band 12	10M	QPSK	1	0	-	Back	0mm	Ant 0	Full Power	23095	707.5	23.97	25.00	1.268	-	-	0.04	0.284	0.360
	LTE Band 12	10M	QPSK	25	0	-	Back	0mm	Ant 0	Full Power	23095	707.5	23.04	24.00	1.247	-	-	-0.01	0.252	0.314
17	LTE Band 12	10M	QPSK	1	0	-	Right Side	0mm	Ant 0	Full Power	23095	707.5	23.97	25.00	1.268	-	-	0.03	0.883	**1.119**
	LTE Band 12	10M	QPSK	25	0	-	Right Side	0mm	Ant 0	Full Power	23095	707.5	23.04	24.00	1.247	-	-	-0.08	0.625	0.780
	LTE Band 12	10M	QPSK	1	0	-	Top Side	0mm	Ant 0	Full Power	23095	707.5	23.97	25.00	1.268	-	-	0.05	0.042	0.053
	LTE Band 12	10M	QPSK	25	0	-	Top Side	0mm	Ant 0	Full Power	23095	707.5	23.04	24.00	1.247	-	-	0.06	0.038	0.047
835MHz																				
	GSM850	-	-	-	-	GPRS (2 Tx slots)	Front	0mm	Ant 0	Full Power	189	836.4	30.84	32.00	1.306	-	-	-0.09	0.406	0.530
	GSM850	-	-	-	-	GPRS (2 Tx slots)	Back	0mm	Ant 0	Full Power	189	836.4	30.84	32.00	1.306	-	-	-0.08	0.191	0.249
18	GSM850	-	-	-	-	GPRS (2 Tx slots)	Right Side	0mm	Ant 0	Full Power	189	836.4	30.84	32.00	1.306	-	-	0.01	1.15	**1.502**
	GSM850	-	-	-	-	GPRS (2 Tx slots)	Top Side	0mm	Ant 0	Full Power	189	836.4	30.84	32.00	1.306	-	-	0.13	0.137	0.179
	WCDMA V	-	-	-	-	RMC 12.2Kbps	Front	0mm	Ant 0	Full Power	4182	836.4	23.17	24.00	1.211	-	-	0.12	0.477	0.577
	WCDMA V	-	-	-	-	RMC 12.2Kbps	Back	0mm	Ant 0	Full Power	4182	836.4	23.17	24.00	1.211	-	-	0.03	0.225	0.272
19	WCDMA V	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Ant 0	Full Power	4182	836.4	23.17	24.00	1.211	-	-	0.09	0.688	**0.833**
	WCDMA V	-	-	-	-	RMC 12.2Kbps	Top Side	0mm	Ant 0	Full Power	4182	836.4	23.17	24.00	1.211	-	-	0.18	0.138	0.167
	LTE Band 26	15M	QPSK	1	0	-	Front	0mm	Ant 0	Full Power	26865	831.5	23.78	24.50	1.180	-	-	0.16	0.393	0.464
	LTE Band 26	15M	QPSK	36	0	-	Front	0mm	Ant 0	Full Power	26865	831.5	22.74	23.50	1.191	-	-	-0.1	0.322	0.384
	LTE Band 26	15M	QPSK	1	0	-	Back	0mm	Ant 0	Full Power	26865	831.5	23.78	24.50	1.180	-	-	0.07	0.185	0.218
	LTE Band 26	15M	QPSK	36	0	-	Back	0mm	Ant 0	Full Power	26865	831.5	22.74	23.50	1.191	-	-	0.18	0.152	0.181
20	LTE Band 26	15M	QPSK	1	0	-	Right Side	0mm	Ant 0	Full Power	26865	831.5	23.78	24.50	1.180	-	-	-0.1	0.589	**0.695**
	LTE Band 26	15M	QPSK	36	0	-	Right Side	0mm	Ant 0	Full Power	26865	831.5	22.74	23.50	1.191	-	-	0.01	0.490	0.584
	LTE Band 26	15M	QPSK	1	0	-	Top Side	0mm	Ant 0	Full Power	26865	831.5	23.78	24.50	1.180	-	-	-0.15	0.122	0.144
	LTE Band 26	15M	QPSK	36	0	-	Top Side	0mm	Ant 0	Full Power	26865	831.5	22.74	23.50	1.191	-	-	0.19	0.100	0.119
1750MHz																				
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Front	0mm	Ant 0	Full Power	1413	1732.6	22.94	24.00	1.276	-	-	-0.15	0.395	0.504
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Back	0mm	Ant 0	Full Power	1413	1732.6	22.94	24.00	1.276	-	-	0.11	0.564	0.720
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Ant 0	sensor on	1413	1732.6	20.76	22.00	1.330	-	-	-0.08	2.15	2.860
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Top Side	0mm	Ant 0	Full Power	1413	1732.6	22.94	24.00	1.276	-	-	-0.17	0.201	0.257
21	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Ant 0	sensor on	1312	1712.4	20.61	22.00	1.377	-	-	0.07	2.23	**3.071**
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Ant 0	sensor on	1513	1752.6	20.74	22.00	1.337	-	-	-0.08	2.19	2.927
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Right Side	10mm	Ant 0	Full Power	1413	1732.6	22.94	24.00	1.276	-	-	0.06	1.10	1.404
	LTE Band 66	20M	QPSK	1	0	-	Front	0mm	Ant 0	Full Power	132322	1745	22.95	24.00	1.274	-	-	-0.04	0.357	0.455
	LTE Band 66	20M	QPSK	50	0	-	Front	0mm	Ant 0	Full Power	132322	1745	22.26	23.00	1.186	-	-	-0.08	0.290	0.344
	LTE Band 66	20M	QPSK	1	0	-	Back	0mm	Ant 0	Full Power	132322	1745	22.95	24.00	1.274	-	-	0.17	0.527	0.671
	LTE Band 66	20M	QPSK	50	0	-	Back	0mm	Ant 0	Full Power	132322	1745	22.26	23.00	1.186	-	-	0.18	0.432	0.512
	LTE Band 66	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	sensor on	132322	1745	21.70	22.50	1.202	-	-	-0.04	2.30	2.765
	LTE Band 66	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	sensor on	132072	1720	21.64	22.50	1.219	-	-	-0.08	2.33	2.840
22	LTE Band 66	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	sensor on	132572	1770	21.50	22.50	1.259	-	-	0.08	2.34	**2.946**
	LTE Band 66	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	sensor on	132322	1745	21.66	22.50	1.213	-	-	-0.13	2.02	2.451
	LTE Band 66	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	sensor on	132072	1720	21.64	22.50	1.219	-	-	-0.13	1.96	2.389
	LTE Band 66	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	sensor on	132572	1770	21.59	22.50	1.233	-	-	0.06	2.06	2.540
	LTE Band 66	20M	QPSK	100	0	-	Right Side	0mm	Ant 0	sensor on	132322	1745	21.63	22.50	1.222	-	-	-0.03	1.99	2.431
	LTE Band 66	20M	QPSK	1	0	-	Top Side	0mm	Ant 0	Full Power	132322	1745	22.95	24.00	1.274	-	-	-0.03	0.192	0.245
	LTE Band 66	20M	QPSK	50	0	-	Top Side	0mm	Ant 0	Full Power	132322	1745	22.26	23.00	1.186	-	-	0.08	0.157	0.186
	LTE Band 66	20M	QPSK	1	0	-	Right Side	10mm	Ant 0	Full Power	132322	1745	22.95	24.00	1.274	-	-	0.09	0.976	1.243
1900MHz																				
	GSM1900	-	-	-	-	GPRS (4 Tx slots)	Front	0mm	Ant 0	Full Power	661	1880	24.27	25.50	1.327	-	-	-0.07	0.209	0.277
	GSM1900	-	-	-	-	GPRS (4 Tx slots)	Back	0mm	Ant 0	Full Power	661	1880	24.27	25.50	1.327	-	-	0.05	0.261	0.346
23	GSM1900	-	-	-	-	GPRS (4 Tx slots)	Right Side	0mm	Ant 0	sensor on	661	1880	22.34	24.00	1.466	-	-	-0.02	1.97	**2.887**

	GSM1900	-	-	-	-	GPRS (4 Tx slots)	Top Side	0mm	Ant 0	Full Power	661	1880	24.27	25.50	1.327	-	-	-0.11	0.079	0.105
	GSM1900	-	-	-	-	GPRS (4 Tx slots)	Right Side	0mm	Ant 0	sensor on	512	1850.2	22.29	24.00	1.483	-	-	-0.12	1.74	2.580
	GSM1900	-	-	-	-	GPRS (4 Tx slots)	Right Side	0mm	Ant 0	sensor on	810	1909.8	22.24	24.00	1.500	-	-	0.03	1.86	2.789
	GSM1900	-	-	-	-	GPRS (4 Tx slots)	Right Side	10mm	Ant 0	Full Power	661	1880	24.27	25.50	1.327	-	-	0.01	0.555	0.737
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Front	0mm	Ant 0	Full Power	9400	1880	22.85	24.00	1.303	-	-	0.08	0.266	0.347
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Back	0mm	Ant 0	Full Power	9400	1880	22.85	24.00	1.303	-	-	0.01	0.344	0.448
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Ant 0	sensor on	9400	1880	20.98	22.00	1.265	-	-	0.03	2.36	2.985
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Top Side	0mm	Ant 0	Full Power	9400	1880	22.85	24.00	1.303	-	-	-0.08	0.115	0.150
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Ant 0	sensor on	9262	1852.4	20.90	22.00	1.288	-	-	-0.08	2.28	2.937
24	WCDMA II	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Ant 0	sensor on	9538	1907.6	20.95	22.00	1.274	-	-	0.08	2.39	**3.044**
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Right Side	10mm	Ant 0	Full Power	9400	1880	22.85	24.00	1.303	-	-	0.05	0.977	1.273
	LTE Band 25	20M	QPSK	1	0	-	Front	0mm	Ant 0	Full Power	26340	1880	22.97	24.00	1.268	-	-	0.1	0.250	0.317
	LTE Band 25	20M	QPSK	50	0	-	Front	0mm	Ant 0	Full Power	26340	1880	22.06	23.00	1.242	-	-	-0.18	0.206	0.256
	LTE Band 25	20M	QPSK	1	0	-	Back	0mm	Ant 0	Full Power	26340	1880	22.97	24.00	1.268	-	-	0.1	0.321	0.407
	LTE Band 25	20M	QPSK	50	0	-	Back	0mm	Ant 0	Full Power	26340	1880	22.06	23.00	1.242	-	-	0.12	0.266	0.330
	LTE Band 25	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	sensor on	26340	1880	21.55	22.50	1.245	-	-	0.08	2.44	3.037
25	LTE Band 25	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	sensor on	26140	1860	21.53	22.50	1.250	-	-	0.06	2.52	**3.151**
	LTE Band 25	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	sensor on	26590	1905	21.48	22.50	1.265	-	-	-0.17	2.45	3.099
	LTE Band 25	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	sensor on	26340	1880	21.41	22.50	1.285	-	-	-0.03	2.04	2.622
	LTE Band 25	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	sensor on	26140	1860	21.32	22.50	1.312	-	-	0.14	2.14	2.808
	LTE Band 25	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	sensor on	26590	1905	21.32	22.50	1.312	-	-	0.11	2.15	2.821
	LTE Band 25	20M	QPSK	100	0	-	Right Side	0mm	Ant 0	sensor on	26340	1880	21.18	22.50	1.355	-	-	-0.05	2.08	2.819
	LTE Band 25	20M	QPSK	1	0	-	Top Side	0mm	Ant 0	Full Power	26340	1880	22.97	24.00	1.268	-	-	0.18	0.108	0.137
	LTE Band 25	20M	QPSK	50	0	-	Top Side	0mm	Ant 0	Full Power	26340	1880	22.06	23.00	1.242	-	-	0.14	0.093	0.115
	LTE Band 25	20M	QPSK	1	0	-	Right Side	10mm	Ant 0	Full Power	26340	1880	22.97	24.00	1.268	-	-	0.04	0.915	1.160
2600MHz																				
	LTE Band 7	20M	QPSK	1	0	-	Front	0mm	Ant 0	Full Power	21100	2535	22.98	24.00	1.265	-	-	-0.17	0.162	0.205
	LTE Band 7	20M	QPSK	50	0	-	Front	0mm	Ant 0	Full Power	21100	2535	22.18	23.00	1.208	-	-	0.17	0.131	0.158
	LTE Band 7	20M	QPSK	1	0	-	Back	0mm	Ant 0	Full Power	21100	2535	22.98	24.00	1.265	-	-	-0.05	0.166	0.210
	LTE Band 7	20M	QPSK	50	0	-	Back	0mm	Ant 0	Full Power	21100	2535	22.18	23.00	1.208	-	-	0.01	0.142	0.172
	LTE Band 7	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	Full Power	21100	2535	22.98	24.00	1.265	-	-	0.1	2.04	2.580
26	LTE Band 7	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	Full Power	20850	2510	22.72	24.00	1.343	-	-	0.02	2.05	**2.753**
	LTE Band 7	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	Full Power	21350	2560	22.93	24.00	1.279	-	-	-0.17	2.03	2.597
	LTE Band 7	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	Full Power	21100	2535	22.18	23.00	1.208	-	-	0.04	1.76	2.126
	LTE Band 7	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	Full Power	20850	2510	22.07	23.00	1.239	-	-	-0.01	1.68	2.081
	LTE Band 7	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	Full Power	21350	2560	21.99	23.00	1.262	-	-	-0.08	1.68	2.120
	LTE Band 7	20M	QPSK	100	0	-	Right Side	0mm	Ant 0	Full Power	21100	2535	22.16	23.00	1.213	-	-	0.05	1.73	2.099
	LTE Band 7	20M	QPSK	1	0	-	Top Side	0mm	Ant 0	Full Power	21100	2535	22.98	24.00	1.265	-	-	0.06	0.026	0.033
	LTE Band 7	20M	QPSK	50	0	-	Top Side	0mm	Ant 0	Full Power	21100	2535	22.18	23.00	1.208	-	-	-0.09	0.022	0.027
	LTE Band 41	20M	QPSK	1	0	-	Front	0mm	Ant 0	Full Power	40140	2545	23.14	24.00	1.219	62.9	1.006	-0.08	0.190	0.233
	LTE Band 41	20M	QPSK	50	0	-	Front	0mm	Ant 0	Full Power	40140	2545	22.15	23.00	1.216	62.9	1.006	0.13	0.164	0.201
	LTE Band 41	20M	QPSK	1	0	-	Back	0mm	Ant 0	Full Power	40140	2545	23.14	24.00	1.219	62.9	1.006	0.12	0.199	0.244
	LTE Band 41	20M	QPSK	50	0	-	Back	0mm	Ant 0	Full Power	40140	2545	22.15	23.00	1.216	62.9	1.006	0.03	0.166	0.203
	LTE Band 41	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	sensor on	40140	2545	22.08	23.00	1.236	62.9	1.006	0.18	1.97	2.449
	LTE Band 41	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	sensor on	40400	2571	22.00	23.00	1.259	62.9	1.006	0.16	2.01	2.546
	LTE Band 41	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	sensor on	40670	2598	21.99	23.00	1.262	62.9	1.006	-0.1	1.99	2.526
27	LTE Band 41	20M	QPSK	1	0	-	Right Side	0mm	Ant 0	sensor on	41140	2645	21.85	23.00	1.303	62.9	1.006	0.05	2.17	**2.845**
	LTE Band 41	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	sensor on	40140	2545	22.02	23.00	1.253	62.9	1.006	0.07	1.65	2.080
	LTE Band 41	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	sensor on	40400	2571	21.95	23.00	1.274	62.9	1.006	0.18	1.69	2.165
	LTE Band 41	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	sensor on	40670	2598	22.00	23.00	1.259	62.9	1.006	-0.1	1.71	2.166
	LTE Band 41	20M	QPSK	50	0	-	Right Side	0mm	Ant 0	sensor on	41140	2645	21.96	23.00	1.271	62.9	1.006	0.01	1.86	2.377
	LTE Band 41	20M	QPSK	100	0	-	Right Side	0mm	Ant 0	sensor on	40140	2545	22.03	23.00	1.250	62.9	1.006	-0.15	1.67	2.100
	LTE Band 41	20M	QPSK	1	0	-	Top Side	0mm	Ant 0	Full Power	40140	2545	23.14	24.00	1.219	62.9	1.006	0.19	0.043	0.053
	LTE Band 41	20M	QPSK	50	0	-	Top Side	0mm	Ant 0	Full Power	40140	2545	22.15	23.00	1.216	62.9	1.006	0.07	0.030	0.037
	LTE Band 41	20M	QPSK	1	0	-	Right Side	10mm	Ant 0	Full Power	40140	2545	23.14	24.00	1.219	62.9	1.006	0.04	0.685	0.840

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
2450MHz																
	WLAN2.4GHz	802.11b 1Mbps	Front	0mm	Ant 1	Full Power	11	2462	15.32	17.00	1.472	100	1.000	0.08	0.078	0.115
	WLAN2.4GHz	802.11b 1Mbps	Back	0mm	Ant 1	Full Power	11	2462	15.32	17.00	1.472	100	1.000	0.01	0.045	0.066
28	WLAN2.4GHz	802.11b 1Mbps	Left Side	0mm	Ant 1	Full Power	11	2462	15.32	17.00	1.472	100	1.000	-0.08	0.914	**1.346**
	WLAN2.4GHz	802.11b 1Mbps	Top Side	0mm	Ant 1	Full Power	11	2462	15.32	17.00	1.472	100	1.000	-0.08	0.015	0.022
	WLAN2.4GHz	802.11b 1Mbps	Left Side	0mm	Ant 1	Full Power	1	2412	13.13	15.00	1.538	100	1.000	-0.08	0.657	1.011
	WLAN2.4GHz	802.11b 1Mbps	Left Side	0mm	Ant 1	Full Power	6	2437	12.38	14.00	1.452	100	1.000	0.1	0.771	1.120
	Bluetooth	1Mbps	Front	0mm	Ant 1	Full Power	39	2441	10.57	12.00	1.391	57.85	1.440	-0.08	0.017	0.034
	Bluetooth	1Mbps	Back	0mm	Ant 1	Full Power	39	2441	10.57	12.00	1.391	57.85	1.440	-0.17	0.000	0.000
29	Bluetooth	1Mbps	Left Side	0mm	Ant 1	Full Power	39	2441	10.57	12.00	1.391	57.85	1.440	0.07	0.162	**0.324**
	Bluetooth	1Mbps	Top Side	0mm	Ant 1	Full Power	39	2441	10.57	12.00	1.391	57.85	1.440	-0.08	0.000	0.000
	Bluetooth	1Mbps	Left Side	0mm	Ant 1	Full Power	0	2402	10.13	12.00	1.539	57.85	1.440	-0.04	0.143	0.317
	Bluetooth	1Mbps	Left Side	0mm	Ant 1	Full Power	78	2480	10.31	12.00	1.477	57.85	1.440	-0.08	0.137	0.291
5000MHz																
	WLAN5.3GHz	802.11a 6Mbps	Front	0mm	Ant 1	Full Power	64	5320	16.31	18.00	1.475	97.65	1.024	0.1	0.047	0.071
	WLAN5.3GHz	802.11a 6Mbps	Back	0mm	Ant 1	Full Power	64	5320	16.31	18.00	1.475	97.65	1.024	-0.17	0.035	0.053
30	WLAN5.3GHz	802.11a 6Mbps	Left Side	0mm	Ant 1	Full Power	64	5320	16.31	18.00	1.475	97.65	1.024	-0.09	0.576	**0.870**
	WLAN5.3GHz	802.11a 6Mbps	Top Side	0mm	Ant 1	Full Power	64	5320	16.31	18.00	1.475	97.65	1.024	0.04	0.024	0.036
	WLAN5.3GHz	802.11a 6Mbps	Left Side	0mm	Ant 1	Full Power	52	5260	16.11	17.50	1.376	97.65	1.024	-0.01	0.436	0.614
	WLAN5.3GHz	802.11a 6Mbps	Left Side	0mm	Ant 1	Full Power	56	5280	16.16	17.50	1.360	97.65	1.024	-0.08	0.515	0.717
	WLAN5.3GHz	802.11a 6Mbps	Left Side	0mm	Ant 1	Full Power	60	5300	16.13	17.50	1.370	97.65	1.024	0.05	0.547	0.767
	WLAN5.5GHz	802.11a 6Mbps	Front	0mm	Ant 1	Full Power	100	5500	16.27	17.50	1.326	97.65	1.024	0.08	0.044	0.060
	WLAN5.5GHz	802.11a 6Mbps	Back	0mm	Ant 1	Full Power	100	5500	16.27	17.50	1.326	97.65	1.024	0.01	0.029	0.039
31	WLAN5.5GHz	802.11a 6Mbps	Left Side	0mm	Ant 1	Full Power	100	5500	16.27	17.50	1.326	97.65	1.024	-0.07	0.576	**0.782**
	WLAN5.5GHz	802.11a 6Mbps	Top Side	0mm	Ant 1	Full Power	100	5500	16.27	17.50	1.326	97.65	1.024	-0.08	0.024	0.033
	WLAN5.5GHz	802.11a 6Mbps	Left Side	0mm	Ant 1	Full Power	116	5580	16.05	17.50	1.395	97.65	1.024	-0.08	0.511	0.730
	WLAN5.5GHz	802.11a 6Mbps	Left Side	0mm	Ant 1	Full Power	132	5660	16.13	17.50	1.370	97.65	1.024	0.1	0.520	0.729
	WLAN5.5GHz	802.11a 6Mbps	Left Side	0mm	Ant 1	Full Power	140	5700	16.15	17.50	1.364	97.65	1.024	-0.18	0.545	0.761
	WLAN5.8GHz	802.11a 6Mbps	Front	0mm	Ant 1	Full Power	149	5745	16.18	17.50	1.354	97.65	1.024	0.12	0.044	0.061
	WLAN5.8GHz	802.11a 6Mbps	Back	0mm	Ant 1	Full Power	149	5745	16.18	17.50	1.354	97.65	1.024	0.08	0.044	0.061
	WLAN5.8GHz	802.11a 6Mbps	Left Side	0mm	Ant 1	Full Power	149	5745	16.18	17.50	1.354	97.65	1.024	-0.17	0.554	0.768
	WLAN5.8GHz	802.11a 6Mbps	Top Side	0mm	Ant 1	Full Power	149	5745	16.18	17.50	1.354	97.65	1.024	-0.03	0.027	0.037
32	WLAN5.8GHz	802.11a 6Mbps	Left Side	0mm	Ant 1	Full Power	157	5785	15.99	17.50	1.415	97.65	1.024	-0.02	0.633	**0.917**
	WLAN5.8GHz	802.11a 6Mbps	Left Side	0mm	Ant 1	Full Power	165	5825	15.95	17.50	1.428	97.65	1.024	0.14	0.620	0.906

15.3 Repeated SAR Measurement

<10g>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Ratio	Reported 10g SAR (W/kg)
1st	LTE Band 66	20M	QPSK	1	0	Right Side	0mm	Ant 0	sensor on	132572	1770	21.50	22.50	1.259	-	-	0.08	2.34	1	2.946
2nd	LTE Band 66	20M	QPSK	1	0	Right Side	0mm	Ant 0	sensor on	132572	1770	21.50	22.50	1.259	-	-	0.01	2.28	1.026	2.870
1st	LTE Band 25	20M	QPSK	1	0	Right Side	0mm	Ant 0	sensor on	26140	1860	21.53	22.50	1.250	-	-	0.06	2.52	1	3.151
2nd	LTE Band 25	20M	QPSK	1	0	Right Side	0mm	Ant 0	sensor on	26140	1860	21.53	22.50	1.250	-	-	0.02	2.46	1.024	3.076
1st	LTE Band 41	20M	QPSK	1	0	Right Side	0mm	Ant 0	sensor on	41140	2645	21.85	23.00	1.303	62.9	1.006	0.05	2.17	1	2.845
2nd	LTE Band 41	20M	QPSK	1	0	Right Side	0mm	Ant 0	sensor on	41140	2645	21.85	23.00	1.303	62.9	1.006	0.03	2.01	1.080	2.635

General Note:

1. Per KDB 865664 D01v01r04, if the extremity repeated SAR is necessary, the same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.
2. The ratio is the difference in percentage between original and repeated *measured SAR*.
3. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

16. Simultaneous Transmission Analysis

No.	Simultaneous Transmission Configurations	POS Terminal	
		Body-worn	Extremity
1.	WWAN + WLAN2.4GHz	Yes	Yes
2.	WWAN + WLAN5GHz	Yes	Yes
3.	WWAN + Bluetooth	Yes	Yes
4.	WWAN + WLAN2.4GHz + NFC		Yes
5.	WWAN + WLAN5GHz+ NFC		Yes
6.	WWAN + Bluetooth+ NFC		Yes

General Note:

1. EUT will choose each WCDMA and LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
2. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment though they have independent antenna.
3. WLAN 2.4GHz and Bluetooth share the same antenna and they can't transmit simultaneously.
4. NFC can transmit simultaneously with other Radios in extremity exposure condition.
5. All licensed modes share the same antenna part and cannot transmit simultaneously.
6. The reported SAR summation is calculated based on the same configuration and test position
7. For distance SAR and non-distance SAR always chose higher SAR to do co-located analysis.
8. For standalone WWAN, always choose the highest SAR among all WWAN bands for each exposure position to perform simultaneous transmission analysis with WLAN/BT. This is the worst co-located analysis and can represent each band.
9. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) 1g Scalar SAR summation < 1.6W/kg and 10g Scalar SAR summation < 4.0W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04 for 1g SAR and SPLSR≤ 0.10 for 10g SAR , simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band 1g SAR < 1.6W/kg and 10g SAR < 4.0W/kg.

16.1 Body-Worn Exposure Conditions

WWAN Band	Exposure Position	1	2	3	4	1+2	1+3	1+4
		WWAN	WLAN2.4GHz Ant 1	WLAN5GHz Ant 1	Bluetooth Ant 1	Summed	Summed	Summed
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)
WWAN All Bands	Front	0.363	0.077	0.067	0.020	0.44	0.43	0.38
	Back	0.499	0.060	0.076		**0.56**	**0.58**	**0.50**

16.2 Extremity Exposure Conditions

WWAN Band	Exposure Position	1	2	3	4	5	1+2+5	1+3+5	1+4+5
		WWAN	WLAN2.4GHz Ant 1	WLAN5GHz Ant 1	Bluetooth Ant 1	NFC	Summed	Summed	Summed
		10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)
WWAN All bands	Front	0.577	0.115	0.071	0.034	0.007	0.70	0.66	0.62
	Back	0.720	0.066	0.061		0.001	0.79	0.78	0.72
	Left side		1.346	0.917	0.324	0.003	1.35	0.92	0.33
	Right side	3.151				0.003	**3.15**	**3.15**	**3.15**
	Top side	0.257	0.022	0.037		0.020	0.30	0.31	0.28
	Bottom side					0.001	0.00	0.00	0.00

Note: NFC SAR value is from another NFC SAR report which is submitted separately.

Test Engineer： Martin Li, Varus Wang, Light Wang, Ricky Gu

17. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

18. References

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

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

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[8] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[9] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[10] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.

[11] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

Appendixes

Please refer to separated files for the following appendixes

Appendix A. Plots of System Performance Check

Appendix B. Plots of High SAR Measurement

Appendix C. DASY Calibration Certificate

Appendix D. Test Setup Photos

Appendix E. Conducted RF Output Power Table

------THE END------