FCC SAR Test Report

Applicant:	Aegex Technologies, LLC
EUT Description:	Tablet
Model:	Aegex100M
Brand:	Aegex
FCC ID:	2AGVY-100MWBXX02
Standards:	FCC 47CFR §2.1093
Date of Receipt:	2024/03/28
Date of Test:	2024/11/07 to 2025/01/06
Date of Issue:	2025/04/18

TOWE. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

the results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of the model are manufactured with identical electrical and mechanical components. All sample tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise. without written approval of TOWE, the test report shall not be reproduced except in full.

Huang Kun	**Li Wei**
Approved By:	**Reviewed By:**

Revision History

Rev.	Issue Date	Description	Revised by
01	2025/04/18	Original	Li Wei

Table of Contents

1 Summary of Test Results

Band	Highest SAR(W/kg)
	Body 1g
WCDMA Band II	0.48
WCDMA Band IV	1.07
WCDMA Band V	0.29
LTE Band 7	0.38
LTE Band 12	0.38
LTE Band 13	0.29
LTE Band 14	0.29
LTE Band 25/2	0.55
LTE Band 26/5	0.33
LTE Band 30	0.63
LTE Band 41/38	0.32
LTE Band 48	0.56
LTE Band 66/4	**1.13**
WI-FI (2.4GHz)	0.48
WI-FI (5GHz)	0.60
BT	0.60
NFC	0.01
Highest Simultaneous Transmission SAR (W/kg)	
Scenario	**Body 1g**
Summed SAR	1.52

Remark:
This device supports LTE B2/B4/B5/B7/B12/B13/B14/B25/B26/B30/B38/B41/B48/B66. Since the supported frequency span for LTE B2/B4/B5/B38 falls completely within the support's frequency span for LTE B25/B66/B26/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/B66/B26/B41.

2 Guidance Applied

FCC 47CFR §2.1093
ANSI/IEEE C95.1-1992
IEC/IEEE 62209-1528:2020
FCC KDB 941225 D01 3G SAR Measurement Procedures v03r01
FCC KDB 941225 D05 SAR for LTE Devices v02r05
FCC KDB 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02
FCC KDB 248227 D01 SAR Guidance for IEEE 802 11 Wi-Fi SAR v02r02
FCC KDB 648474 D04 Handset SAR v01r03
FCC KDB 447498 D01 General RF Exposure Guidance v06
FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
FCC KDB 865664 D02 RF Exposure Reporting v01r02
FCC KDB 616217 D04 SAR for laptop and tablets v01r02

3 Lab Information

3.1 Testing Location

These measurements tests were conducted at the Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. facility located at F401 and F101, Building E, Hongwei Industrial Zone, Liuxian 3rd Road, Bao'an District, Shenzhen, China. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014
Tel.: +86-755-27212361
Contact Email: info@towewireless.com

3.2 Test Facility / Accreditations

A2LA (Certificate Number: 7088.01)
This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

FCC Designation No.: CN1353
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized as an accredited testing laboratory.
Designation Number: CN1353.

ISED CAB identifier: CN0152
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized by ISED as an accredited testing laboratory.
CAB identifier: CN0152
Company Number: 31000

3.3 Ambient Condition

Temperature: 18°C~25°C
Relative Humidity: 30%~75%

4 Client Information

4.1 Applicant

Applicant:	Aegex Technologies, LLC
Address:	84 Peachtree Street NW,Atlanta, GA 30303, USA

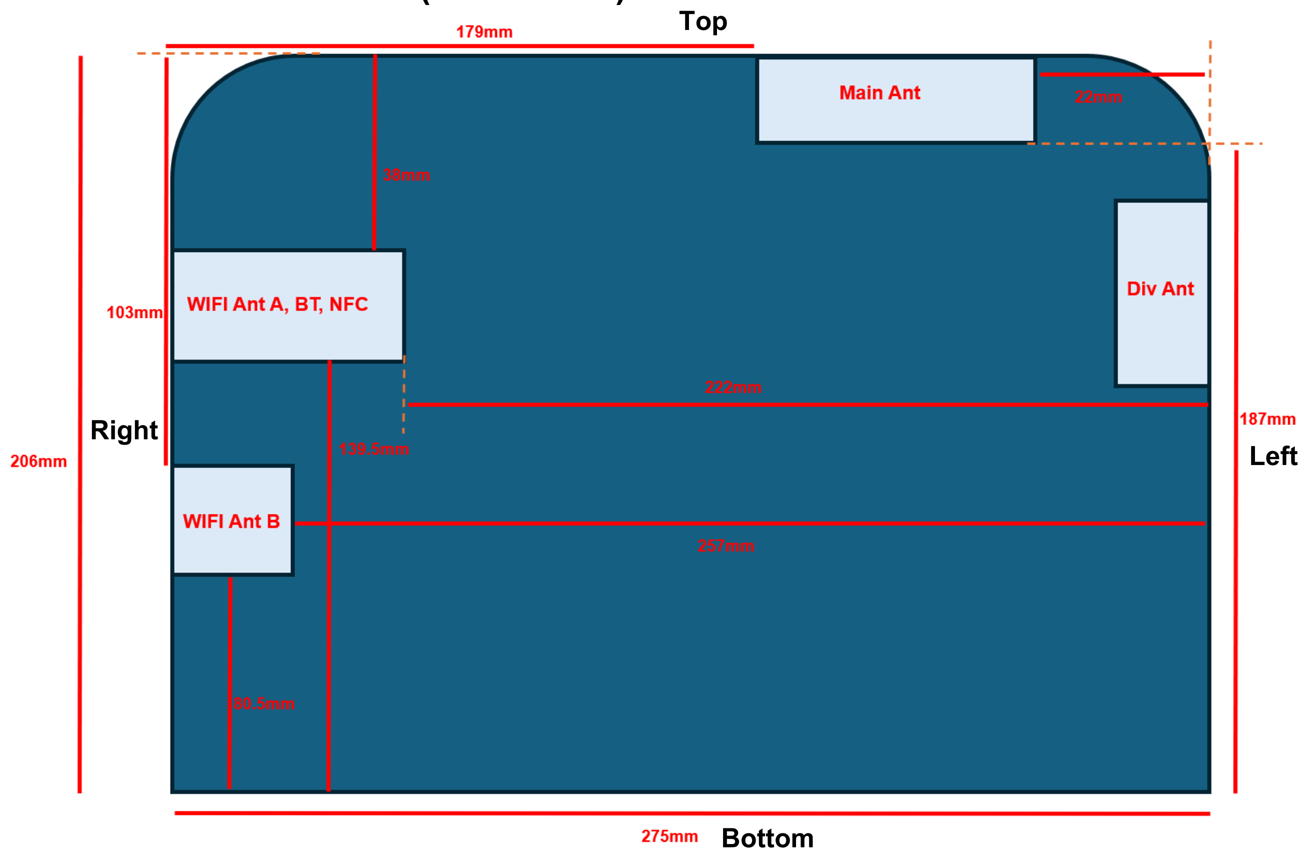
4.2 Manufacturer

Manufacturer:	Aegex Technologies, LLC
Address:	84 Peachtree Street NW,Atlanta, GA 30303, USA

5 Product Information

<table>
<tr><td>EUT Description</td><td colspan="2">Tablet</td></tr>
<tr><td>Model No.</td><td colspan="2">Aegex100M</td></tr>
<tr><td>Brand</td><td colspan="2">Aegex</td></tr>
<tr><td>Hardware Version</td><td colspan="2">Aegex100M</td></tr>
<tr><td>Software Version</td><td colspan="2">Windows 11 IoT Enterprise</td></tr>
<tr><td>IMEI</td><td colspan="2">863547050057229</td></tr>
<tr><td colspan="3">Device Capabilities:</td></tr>
<tr><td>Band</td><td>Frequency Range (MHz)</td><td>Modulation Type</td></tr>
<tr><td>WCDMA Band II</td><td>1850 ~ 1910</td><td rowspan="3">RMC, HSDPA, HSUPA, DC-HSDPA</td></tr>
<tr><td>WCDMA Band IV</td><td>1710 ~ 1755</td></tr>
<tr><td>WCDMA Band V</td><td>824 ~ 849</td></tr>
<tr><td>LTE Band 2</td><td>1850 ~ 1910</td><td rowspan="14">QPSK
16QAM
64QAM</td></tr>
<tr><td>LTE Band 4</td><td>1710 ~ 1755</td></tr>
<tr><td>LTE Band 5</td><td>824 ~ 849</td></tr>
<tr><td>LTE Band 7</td><td>2500 ~ 2570</td></tr>
<tr><td>LTE Band 12</td><td>699 ~ 716</td></tr>
<tr><td>LTE Band 13</td><td>777 ~ 787</td></tr>
<tr><td>LTE Band 14</td><td>788 ~ 798</td></tr>
<tr><td>LTE Band 25</td><td>1850 ~ 1915</td></tr>
<tr><td>LTE Band 26</td><td>814 ~ 849</td></tr>
<tr><td>LTE Band 30</td><td>2305 ~ 2315</td></tr>
<tr><td>LTE Band 38</td><td>2570 ~ 2620</td></tr>
<tr><td>LTE Band 41</td><td>2496 ~ 2690</td></tr>
<tr><td>LTE Band 48</td><td>3550 ~ 3700</td></tr>
<tr><td>LTE Band 66</td><td>1710 ~ 1780</td></tr>
<tr><td>NFC</td><td>13.56</td><td>ASK</td></tr>
<tr><td>Bluetooth</td><td>2400~2483.5</td><td>GFSK, π/4DQPSK, 8DPSK</td></tr>
<tr><td>Wi-Fi 2.4G</td><td>2400~2483.5</td><td>802.11b/g/n/11ax</td></tr>
<tr><td rowspan="4">Wi-Fi 5G</td><td>5150~5250</td><td rowspan="4">802.11a/n/ac/ax</td></tr>
<tr><td>5250~5350</td></tr>
<tr><td>5470~5725</td></tr>
<tr><td>5725~5850</td></tr>
<tr><td>Antenna Type</td><td colspan="2">☐ External, ☒ Integrated</td></tr>
<tr><td colspan="3">Remark: The above EUT's information was declared by applicant, please refer to the specifications or user's manual for more detailed description.</td></tr>
</table>

5.1 Antenna Locations (Back View)



Note:
1) Per KDB 616217, the diagonal length is > 200mm, the device is considered a “tablet” device and needed to test 0mm 1-g body SAR.
2) The Div antenna is only for RX.

5.2 EUT side for SAR Testing

Stand-alone SAR test evaluation

1) Per FCC KDB 447498D01, the 1g and 10g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where:
• f(GHz) is the RF channel transmit frequency in GHz
• Power and distance are rounded to the nearest mW and mm before calculation
• The result is rounded to one decimal place for comparison
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
2) At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following:
a) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
b) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm) ·10] mW at > 1500 MHz and ≤ 6 GHz

1) Standalone SAR exclusion calculation (Antenna to adjacent sides<50mm)

Band	Exposure Condition	f (GHz)	Pmax	Pmax	separation distance(mm)					Calculated Value					SAR Test（Yes or No）				
			(dBm)	(mw)	Back side	Right side	Left side	Top side	Bottom side	Back side	Right side	Left side	Top side	Bottom side	Back side	Right side	Left side	Top side	Bottom side
WCDMA B2	Body 0mm	1.91	24.00	251.19	5	179	22	5	187	69.430	>50mm	15.780	69.430	>50mm	Yes	>50mm	Yes	Yes	>50mm
WCDMA B4	Body 0mm	1.755	23.50	223.87	5	179	22	5	187	59.316	>50mm	13.481	59.316	>50mm	Yes	>50mm	Yes	Yes	>50mm
WCDMA B5	Body 0mm	0.849	24.00	251.19	5	179	22	5	187	46.290	>50mm	10.520	46.290	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B2	Body 0mm	1.91	24.00	251.19	5	179	22	5	187	69.430	>50mm	15.780	69.430	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B4	Body 0mm	1.755	23.50	223.87	5	179	22	5	187	59.316	>50mm	13.481	59.316	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B5	Body 0mm	0.849	24.00	251.19	5	179	22	5	187	46.290	>50mm	10.520	46.290	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B7	Body 0mm	2.57	24.00	251.19	5	179	22	5	187	80.537	>50mm	18.304	80.537	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B12	Body 0mm	0.716	24.00	251.19	5	179	22	5	187	42.510	>50mm	9.661	42.510	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B13	Body 0mm	0.787	24.00	251.19	5	179	22	5	187	44.567	>50mm	10.129	44.567	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B14	Body 0mm	0.798	24.00	251.19	5	179	22	5	187	44.878	>50mm	10.199	44.878	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B25	Body 0mm	1.915	24.00	251.19	5	179	22	5	187	69.521	>50mm	15.800	69.521	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B26	Body 0mm	0.849	24.00	251.19	5	179	22	5	187	46.290	>50mm	10.520	46.290	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B30	Body 0mm	2.315	24.00	251.19	5	179	22	5	187	76.437	>50mm	17.372	76.437	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B38	Body 0mm	2.62	24.00	251.19	5	179	22	5	187	81.317	>50mm	18.481	81.317	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B41	Body 0mm	2.69	24.00	251.19	5	179	22	5	187	82.396	>50mm	18.726	82.396	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B66	Body 0mm	1.78	23.50	223.87	5	179	22	5	187	59.737	>50mm	13.576	59.737	>50mm	Yes	>50mm	Yes	Yes	>50mm
LTE B48	Body 0mm	3.7	18.00	63.10	5	179	22	5	187	24.273	>51mm	5.517	24.273	>50mm	Yes	>50mm	Yes	Yes	>50mm
WIFI 2.4G Ant A	Body 0mm	2.4835	9.00	7.94	5	5	222	38	139.5	2.504	2.504	>50mm	0.329	>50mm	Yes	Yes	>50mm	Yes	>50mm
WIFI 2.4G Ant B	Body 0mm	2.4835	9.00	7.94	5	5	257	103	80.5	2.504	2.504	>50mm	>50mm	>50mm	Yes	Yes	>50mm	>50mm	>50mm
WIFI 2.4G MIMO	Body 0mm	2.4835	12.00	15.85	5	5	222	38	80.5	4.995	4.995	>50mm	0.657	>50mm	Yes	Yes	>50mm	Yes	>50mm
WIFI 5G Ant A	Body 0mm	5.850	6.00	3.98	5	5	222	38	139.5	1.926	1.926	>50mm	0.253	>50mm	Yes	Yes	>50mm	Yes	>50mm
WIFI 5G Ant B	Body 0mm	5.850	6.00	3.98	5	5	257	103	80.5	1.926	1.926	>50mm	>50mm	>50mm	Yes	Yes	>50mm	>50mm	>50mm
WIFI 5G MIMO	Body 0mm	5.850	8.50	7.08	5	5	222	38	80.5	3.425	3.425	>50mm	0.451	>50mm	Yes	Yes	>50mm	Yes	>50mm
BT	Body 0mm	2.4835	11.00	12.59	5	5	222	38	139.5	3.968	3.968	>50mm	0.522	>50mm	Yes	Yes	>50mm	Yes	>50mm

2) Standalone SAR exclusion calculation (Antenna to adjacent sides>50mm)

Band	Exposure Condition	f (GHz)	Pmax	Pmax	separation distance(mm)					Calculated Value					SAR Test（Yes or No）				
			(dBm)	(mw)	Back side	Right side	Left side	Top side	Bottom side	Back side	Right side	Left side	Top side	Bottom side	Back side	Right side	Left side	Top side	Bottom side
WCDMA B2	Body 0mm	1.91	24.00	251.19	5	179	22	5	187	<50mm	1398.82	<50mm	<50mm	1478.82	<50mm	No	<50mm	<50mm	No
WCDMA B4	Body 0mm	1.755	23.50	223.87	5	179	22	5	187	<50mm	1403.37	<50mm	<50mm	1483.37	<50mm	No	<50mm	<50mm	No
WCDMA B5	Body 0mm	0.849	24.00	251.19	5	179	22	5	187	<50mm	894.31	<51mm	<50mm	939.59	<50mm	No	<50mm	<50mm	No
LTE B2	Body 0mm	1.91	24.00	251.19	5	179	22	5	187	<50mm	1398.82	<50mm	<50mm	1478.82	<50mm	No	<50mm	<50mm	No
LTE B4	Body 0mm	1.755	23.50	223.87	5	179	22	5	187	<50mm	1403.37	<50mm	<50mm	1483.37	<50mm	No	<50mm	<50mm	No
LTE B5	Body 0mm	0.849	24.00	251.19	5	179	22	5	187	<50mm	894.31	<51mm	<50mm	939.59	<50mm	No	<50mm	<50mm	No
LTE B7	Body 0mm	2.57	24.00	251.19	5	179	22	5	187	<50mm	1383.03	<50mm	<50mm	1463.03	<50mm	No	<50mm	<50mm	No
LTE B12	Body 0mm	0.716	24.00	251.19	5	179	22	5	187	<50mm	779.93	<51mm	<50mm	818.12	<50mm	No	<50mm	<50mm	No
LTE B13	Body 0mm	0.787	24.00	251.19	5	179	22	5	187	<50mm	840.99	<51mm	<50mm	882.97	<50mm	No	<50mm	<50mm	No
LTE B14	Body 0mm	0.798	24.00	251.19	5	179	22	5	187	<50mm	850.45	<51mm	<50mm	893.01	<50mm	No	<50mm	<50mm	No
LTE B25	Body 0mm	1.915	24.00	251.19	5	179	22	5	187	<50mm	1398.82	<50mm	<50mm	1478.82	<50mm	No	<50mm	<50mm	No
LTE B26	Body 0mm	0.849	24.00	251.19	5	179	22	5	187	<50mm	894.31	<51mm	<50mm	939.59	<50mm	No	<50mm	<50mm	No
LTE B30	Body 0mm	2.315	24.00	251.19	5	179	22	5	187	<50mm	1385.83	<50mm	<50mm	1465.83	<50mm	No	<50mm	<50mm	No
LTE B38	Body 0mm	2.62	24.00	251.19	5	179	22	5	187	<50mm	1383.03	<50mm	<50mm	1463.03	<50mm	No	<50mm	<50mm	No
LTE B41	Body 0mm	2.69	24.00	251.19	5	179	22	5	187	<50mm	1383.03	<50mm	<50mm	1463.03	<50mm	No	<50mm	<50mm	No
LTE B66	Body 0mm	1.78	23.50	223.87	5	179	22	5	187	<50mm	1403.37	<50mm	<50mm	1483.37	<50mm	No	<50mm	<50mm	No
LTE B48	Body 0mm	3.7	18.00	63.10	5	179	22	5	187	<50mm	1369.07	<50mm	<50mm	1449.07	<50mm	No	<50mm	<50mm	No
WIFI 2.4G Ant A	Body 0mm	2.4835	9.00	7.94	5	5	222	38	139.5	<50mm	<50mm	1815.83	<50mm	990.83	<50mm	<50mm	No	<50mm	No
WIFI 2.4G Ant B	Body 0mm	2.4835	9.00	7.94	5	5	257	103	80.5	<50mm	<50mm	2165.83	625.83	400.83	<50mm	<50mm	No	No	No
WIFI 2.4G MIMO	Body 0mm	2.4835	12.00	15.85	5	5	222	38	80.5	<50mm	<50mm	1815.83	<50mm	400.83	<50mm	<50mm	No	<50mm	No
WIFI 5G Ant A	Body 0mm	5.850	6.00	3.98	5	5	222	38	139.5	<50mm	<50mm	1782.29	<50mm	957.29	<50mm	<50mm	No	<50mm	No
WIFI 5G Ant B	Body 0mm	5.850	6.00	3.98	5	5	257	103	80.5	<50mm	<50mm	2132.29	592.29	367.29	<50mm	<50mm	No	No	No
WIFI 5G MIMO	Body 0mm	5.850	8.50	7.08	5	5	222	38	80.5	<50mm	<50mm	1782.29	<50mm	367.29	<50mm	<50mm	No	<50mm	No
BT	Body 0mm	2.4835	11.00	12.59	5	5	222	38	139.5	<50mm	<50mm	1815.83	<50mm	990.83	<50mm	<50mm	No	<50mm	No

According to the table above, the standalone test configurations required for this device are as below:

Test configurations	Front side	Back side	Left side	Right side	Top side	Bottom side
Main Ant	No	Yes	Yes	No	Yes	No
WIFI 2.4G Ant A	No	Yes	No	Yes	Yes	No
WIFI 2.4G Ant B	No	Yes	No	Yes	Yes	No
WIFI 2.4G MIMO	No	Yes	No	Yes	Yes	No
WIFI 5G Ant A	No	Yes	No	Yes	Yes	No
WIFI 5G Ant B	No	Yes	No	Yes	Yes	No
WIFI 5G MIMO	No	Yes	No	Yes	Yes	No
BT	No	Yes	No	Yes	Yes	No

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

1) (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]· [√f(GHz)/x] W/kg for test separation distances ≤ 50 mm, where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

2) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distance is > 50 mm.

Mode	Position	Pmax (dBm)	Pmax (mw)	test separation distance(mm)					f(GHz)	X	Estimated SAR(W/Kg)				
				Back side	Left side	Right side	Top side	Bottom side			Back side	Left side	Right side	Top side	Bottom side
WCDMA B2	Body 0mm	24.00	251.19	5	179	22	5	187	1.91	7.5	measure	measure	0.400	measure	0.400
WCDMA B4	Body 0mm	23.50	223.87	5	179	22	5	187	1.755	7.5	measure	measure	0.400	measure	0.400
WCDMA B5	Body 0mm	24.00	251.19	5	179	22	5	187	0.849	7.5	measure	measure	0.400	measure	0.400
LTE B2	Body 0mm	24.00	251.19	5	179	22	5	187	1.91	7.5	measure	measure	0.400	measure	0.400
LTE B4	Body 0mm	23.50	223.87	5	179	22	5	187	1.755	7.5	measure	measure	0.400	measure	0.400
LTE B5	Body 0mm	24.00	251.19	5	179	22	5	187	0.849	7.5	measure	measure	0.400	measure	0.400
LTE B7	Body 0mm	24.00	251.19	5	179	22	5	187	2.57	7.5	measure	measure	0.400	measure	0.400
LTE B12	Body 0mm	24.00	251.19	5	179	22	5	187	0.716	7.5	measure	measure	0.400	measure	0.400
LTE B13	Body 0mm	24.00	251.19	5	179	22	5	187	0.787	7.5	measure	measure	0.400	measure	0.400
LTE B14	Body 0mm	24.00	251.19	5	179	22	5	187	0.798	7.5	measure	measure	0.400	measure	0.400
LTE B25	Body 0mm	24.00	251.19	5	179	22	5	187	1.915	7.5	measure	measure	0.400	measure	0.400
LTE B26	Body 0mm	24.00	251.19	5	179	22	5	187	0.849	7.5	measure	measure	0.400	measure	0.400
LTE B30	Body 0mm	24.00	251.19	5	179	22	5	187	2.315	7.5	measure	measure	0.400	measure	0.400
LTE B38	Body 0mm	24.00	251.19	5	179	22	5	187	2.62	7.5	measure	measure	0.400	measure	0.400
LTE B41	Body 0mm	24.00	251.19	5	179	22	5	187	2.69	7.5	measure	measure	0.400	measure	0.400
LTE B66	Body 0mm	23.50	223.87	5	179	22	5	187	1.78	7.5	measure	measure	0.400	measure	0.400
LTE B48	Body 0mm	18.00	63.10	5	179	22	5	187	3.7	7.5	measure	measure	0.400	measure	0.400
WIFI 2.4G Ant A	Body 0mm	9.00	7.94	5	5	222	38	139.5	2.462	7.5	measure	0.400	measure	measure	0.400
WIFI 2.4G Ant B	Body 0mm	9.00	7.94	5	5	257	103	80.5	2.462	7.5	measure	0.400	measure	measure	0.400
WIFI 2.4G MIMO	Body 0mm	12.00	15.85	5	5	222	38	80.5	2.462	7.5	measure	0.400	measure	measure	0.400
WIFI 5G Ant A	Body 0mm	6.00	3.98	5	5	222	38	139.5	5.850	7.5	measure	0.400	measure	measure	0.400
WIFI 5G Ant B	Body 0mm	6.00	3.98	5	5	257	103	80.5	5.850	7.5	measure	0.400	measure	measure	0.400
WIFI 5G MIMO	Body 0mm	8.50	7.08	5	5	222	20	80.5	5.850	7.5	measure	0.400	measure	measure	0.400
BT	Body 0mm	11.00	12.59	5	5	222	38	139.5	2.4835	7.5	measure	0.400	measure	measure	0.400

Table 1： Estimated SAR calculation for the device.

Note:

1) * - maximum possible output power declared by manufacturer

5.3 Power reduction specification

This device uses a single fixed level of power reduction through static table look-up for SAR compliance and it is triggered by a single event or operation:

1) The proximity sensor is used to indicate when the device is held close to a user's body exposure condition. It utilizes the proximity sensor to reduce the output power in specific wireless and operating modes WWAN antenna to ensure SAR compliance.

The detailed power reduction information can refer to the conducted RF output power table.

6 RF Exposure Limits

Human Exposure	Uncontrolled Environment General Population (W/kg) or (mW/g)	Controlled Environment Occupational (W/kg) or (mW/g)
Spatial Peak SAR[1] (Brain/Trunk)	1.6	8.0
Spatial Average SAR[2] (Whole Body)	0.08	0.4
Spatial Peak SAR[3] (Hands/Feet/Ankle/Wrist)	4.0	20.0

Note:

1, The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

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

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

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.

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.

7 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.

7.1 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:

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

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

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

Where:

σ is the conductivity of the tissue material (S/m)

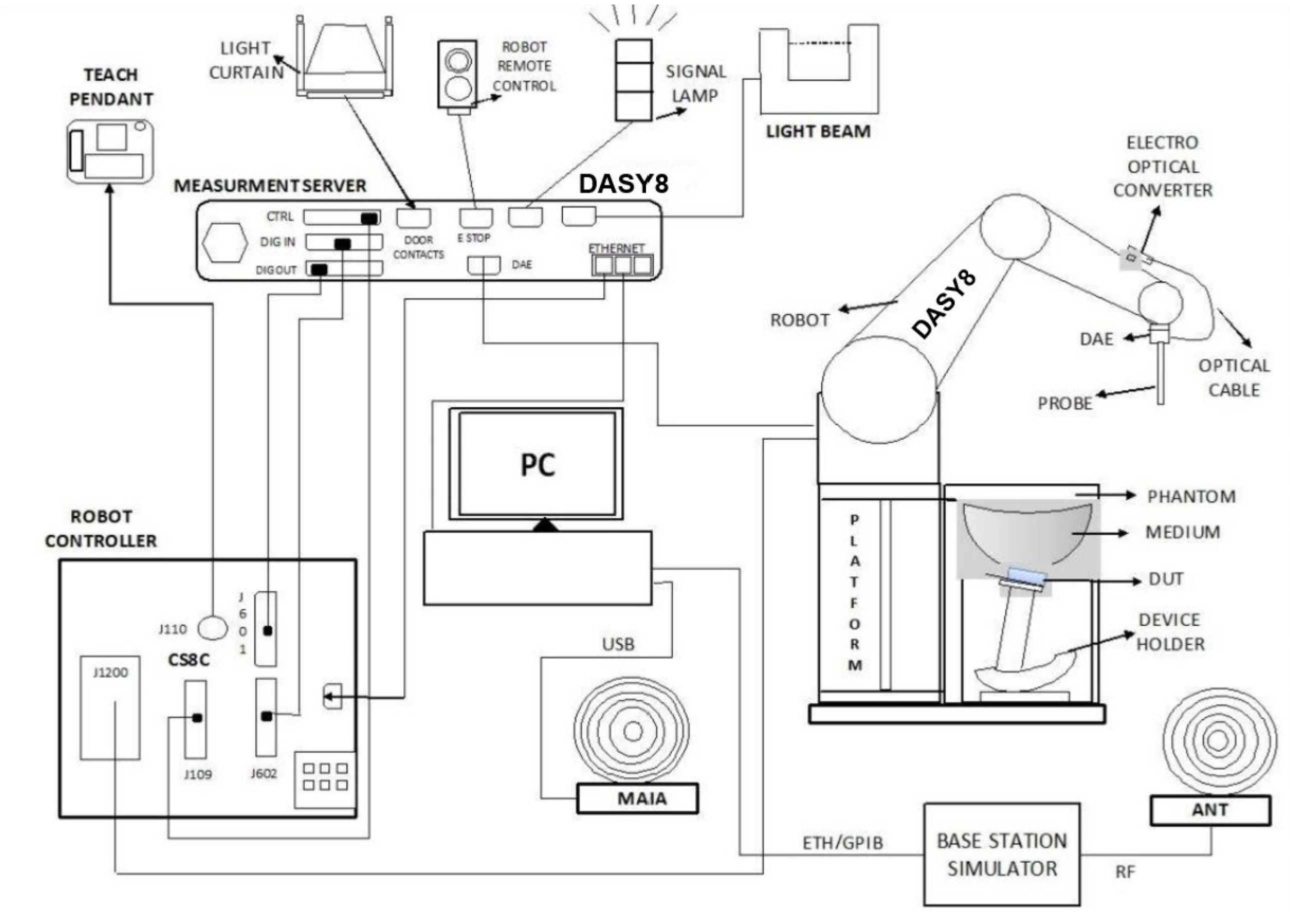
ρ is the mass density of the tissue material (kg/m^3)

E is the RMS electrical field strength (V/m)

8 SAR Measurements System

8.1 The SAR Measurement Set-up

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 Windows 11 and the DASY8 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.

8.2 E-Field Probe

	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 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

8.3 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.

8.4 Phantom

SAM Twin Phantom:

Material	Vinylester, glass fiber reinforced (VE-GF)	
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)	
Dimensions (incl. Wooden Support)	Length: 1000 mm Width: 500 mm Height: adjustable feet	
Filling Volume	Approx. 25 liters	
Wooden Support	SPEAG standard phantom table	

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

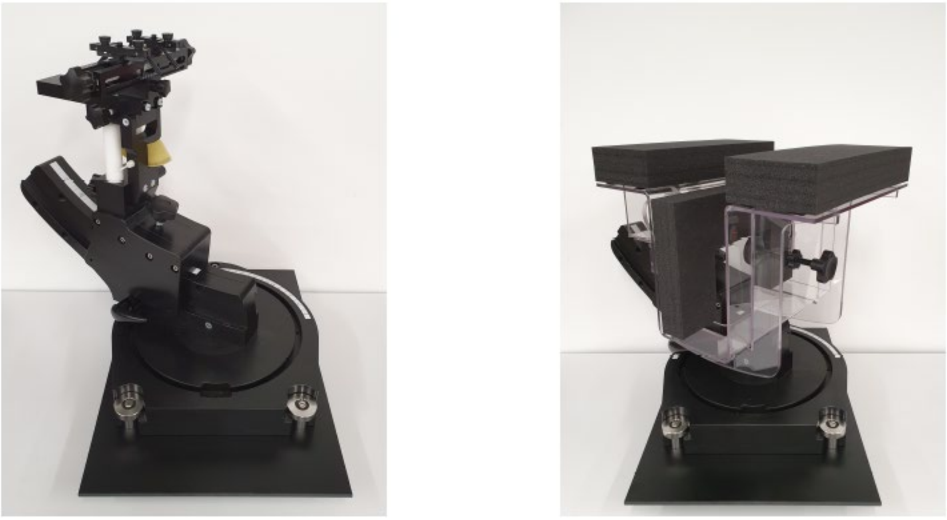
Material	Vinylester, glass fiber reinforced (VE-GF)	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	
Filling Volume	approx. 30 liters	
Wooden Support	SPEAG standard phantom table	

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

8.5 Device Holder

The SAR measured in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5mm distance, a positioning uncertainty of ±0.5mm would produce uncertainty in the SAR of ±20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions at which the devices must be measured are defined by the standards. The DASY8 device holder along with the associated adaptors / options is designed to accommodate different types & sizes (laptops, tablets, phones) of test devices and yet provide accurate and repeatable positioning as described in the test standards.

The device holder is available in two configurations (see Figure 3.13.1): for hand held transmitters (mobile phones) – MD4HHTV5 – Mounting Device for Hand-Held Transmitters and for Body-Worn transmitters – MD4LAP5 – Mounting Device for laptops and other body worn transmitters.



(a) MD4HHTV5 (b) MD4LAPV5

Figure 3.13.1: Mounting Device for Hand-Held Devices and Laptop / Body-Worn Devices

8.6 Measurement procedure

8.6.1 Power reference measurement

The Power Reference Measurement and Power Drift Measurement jobs are useful jobs 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.

8.6.2 Area scan

Measurement procedures for evaluating SAR from wireless handsets typically start with a coarse measurement grid to determine the approximate location of the local peak SAR values. This is known as the area-scan procedure. In addition, identify the positions of any local maxima with SAR values within 2 dB of the maximum value, and that will not be within the zoom scan of other peaks. Additional zoom scans shall be measured for such peaks only when the primary peak is within 2 dB of the SAR compliance limit.

Area scan parameters extracted from IEC/IEEE 62209-1528 SAR measurement as below:

Parameter	DUT transmit frequency being tested	
	$f \leq 3$ GHz	3 GHz < $f \leq 10$ GHz
Maximum distance between the measured points (geometric centre of the sensors) and the inner phantom surface (z_{M1} in Figure 20 in mm)	5 ± 1	δ ln(2)/2 ± 0,5 [a]
Maximum spacing between adjacent measured points in mm (see O.8.3.1)[b]	20, or half of the corresponding zoom scan length, whichever is smaller	60 / f, or half of the corresponding zoom scan length, whichever is smaller
Maximum angle between the probe axis and the phantom surface normal (α in Figure 20)[c]	5° (flat phantom only) 30° (other phantoms)	5° (flat phantom only) 20° (other phantoms)
Tolerance in the probe angle	1°	1°

a δ is the penetration depth for a plane-wave incident normally on a planar half-space.

b See Clause O.8 on how Δx and Δy may be selected for individual area scan requirements.

c The probe angle relative to the phantom surface normal is restricted due to the degradation in the measurement accuracy in fields with steep spatial gradients. The measurement accuracy decreases with increasing probe angle and increasing frequency. This is the reason for the tighter probe angle restriction at frequencies above 3 GHz.

8.6.3 Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose 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 g and 10 g and displays these values next to the job's label.

Zoom Scan parameters extracted from IEC/IEEE 62209-1528 SAR measurement as below:

Parameter	DUT transmit frequency being tested	
	$f \leq 3$ GHz	3 GHz < $f \leq 10$ GHz
Maximum distance between the closest measured points and the phantom surface (z_{M1} in Figure 20 and Table 3, in mm)	5	$\delta \ln(2)/2$ [a]
Maximum angle between the probe axis and the phantom surface normal (α in Figure 20)	5° (flat phantom only) 30° (other phantoms)	5° (flat phantom only) 20° (other phantoms)
Maximum spacing between measured points in the x- and y-directions (Δx and Δy, in mm)	8	$24 / f$ [b]
For uniform grids: Maximum spacing between measured points in the direction normal to the phantom shell (Δz_1 in Figure 20, in mm)	5	$10 / (f - 1)$
For graded grids: Maximum spacing between the two closest measured points in the direction normal to the phantom shell (Δz_1 in Figure 20, in mm)	4	$12 / f$
For graded grids: Maximum incremental increase in the spacing between measured points in the direction normal to the phantom shell ($R_z = \Delta z_2/\Delta z_1$ in Figure 20)	1,5	1,5
Minimum edge length of the zoom scan volume in the x- and y-directions (L_z in O.8.3.2, in mm)	30	22
Minimum edge length of the zoom scan volume in the direction normal to the phantom shell (L_h in O.8.3.2 in mm)	30	22
Tolerance in the probe angle	1°	1°
[a] δ is the penetration depth for a plane-wave incident normally on a planar half-space. [b] This is the maximum spacing allowed, which might not work for all circumstances.		

8.6.4 Power Drift Measurement

The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test that must remain within a maximum variation of ±5%. Detail power drift measurement refer to appendix B.

9 Test Equipment list

Manufacturer	Equipment Name	Model	Serial Number	Calibration Date	Due Date of calibration
SPEAG	ELI	ELI V8.0	2222	NCR	NCR
SPEAG	ELI	ELI V8.0	2227	NCR	NCR
SPEAG	E-Field Probe	EX3DV4	7812	2024/06/25	2025/06/24
SPEAG	E-Field Probe	EX3DV4	7858	2024/01/09	2025/01/08
SPEAG	Data Acquisition Electronics	DAE4	1846	2023/11/29	2024/11/28
				2024/12/10	2025/12/09
SPEAG	Data Acquisition Electronics	DAE4	1847	2024/01/04	2025/01/03
				2024/12/31	2025/12/30
SPEAG	System Validation Kits	CLA13	1043	2024/01/03	2027/01/02
SPEAG	System Validation Kits	D750V3	1231	2023/05/04	2026/05/03
SPEAG	System Validation Kits	D835V2	4d302	2023/02/06	2026/02/05
SPEAG	System Validation Kits	D1750V2	1115	2023/03/23	2026/03/22
SPEAG	System Validation Kits	D1950V3	1266	2023/01/27	2026/01/26
SPEAG	System Validation Kits	D2300V2	1137	2023/05/05	2026/05/04
SPEAG	System Validation Kits	D2450V2	1099	2023/02/02	2026/02/01
SPEAG	System Validation Kits	D2600V2	1094	2023/03/23	2026/03/22
SPEAG	System Validation Kits	D3500V2	1150	2023/05/15	2026/05/14
SPEAG	System Validation Kits	D3700V2	1127	2023/05/10	2026/05/09
SPEAG	System Validation Kits	D5GHzV2	1371	2023/02/03	2026/02/02
SPEAG	Dielectric parameter probes	DAK3.5	1341	2024/07/15	2025/07/14
SPEAG	Dielectric parameter probes	DAK12	1199	2024/01/16	2025/01/15
Anritsu	Radio Communication Analyzer	MT8821C	6262170463	2024/03/25	2025/03/24
Anritsu	Radio Communication Analyzer	MT8821C	6261991091	2024/03/25	2025/03/24
R&S	Wideband Radio Communication Tester	CMW500	153024	2024/03/25	2025/03/24
Talent Microwave	Directional Coupler	TC-05180-10S	220420003	NCR	NCR
R&S	Signal Generator	SMR20	100621	2024/03/25	2025/03/24
QiJi	Preamplifier	YX28982302	TOWE-EQ-SR-020	NCR	NCR
QiJi	Preamplifier	YX28982301	TOWE-EQ-SR-021	NCR	NCR
R&S	Power Sensor	NRP-Z21	101651	2024/03/25	2025/03/24
R&S	Power Sensor	NRP-Z21	104189	2024/03/25	2025/03/24
HiSiDiKe	Thermometer	TP300	TOWE-EQ-SR-023	2024/03/27	2025/03/26
BingYu	Temperature and Humidity Indicator	HTC-1	TOWE-EQ-SR-024	2024/03/26	2025/03/25

Note:

1. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged or repaired during the interval.

2. The justification data of dipole can be found in Appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

10 SAR measurement variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 or 2 W/kg (1-g or 10-g respectively); steps2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 or 2 W/kg (1-g or 10-g respectively), repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 or 3.6W/kg (~ 10% from the 1-g or 10-g respective SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20

11 Description of Test Position

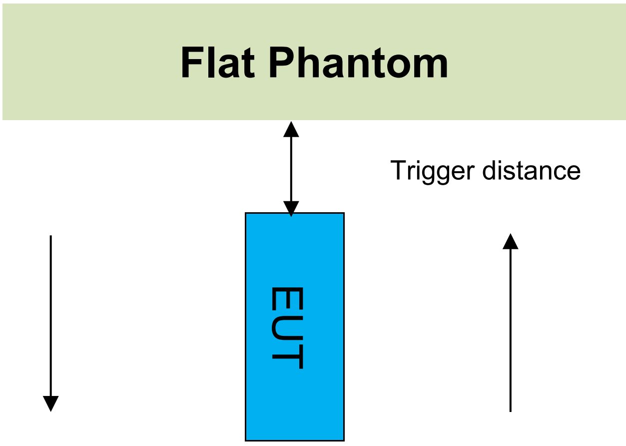
11.1 Body exposure conditions

The overall diagonal dimension of the display section of a tablet is > 20 cm, Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. SAR evaluation for the front surface of tablet display screens is generally not necessary. The SAR Exclusion Threshold in KDB 447498 D04 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

11.2 Proximity Sensor Triggering Test

1) Proximity sensor triggering distances

The Proximity sensor triggering was applied to WWAN antenna. Proximity sensor triggering distance testing was performed in which the EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed.

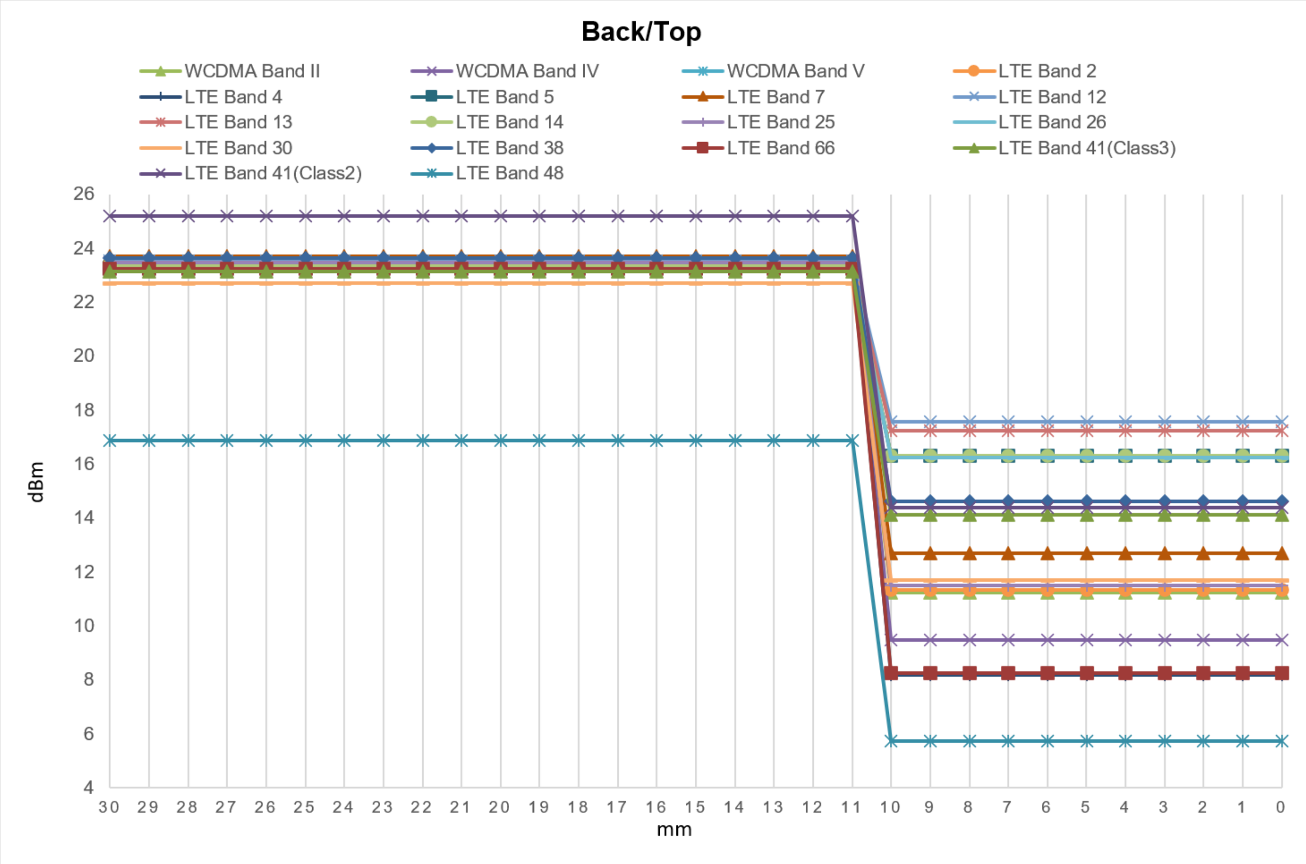


Proximity Sensor Triggering Distance(mm)		
Antenna	Main Ant	
Band	WCDMA Band II/IV/V, LTE Band 2/4/5/7/12/13/14/25/26/30/38/41/48/66	
Position	Back	Top
Minimum	10	10

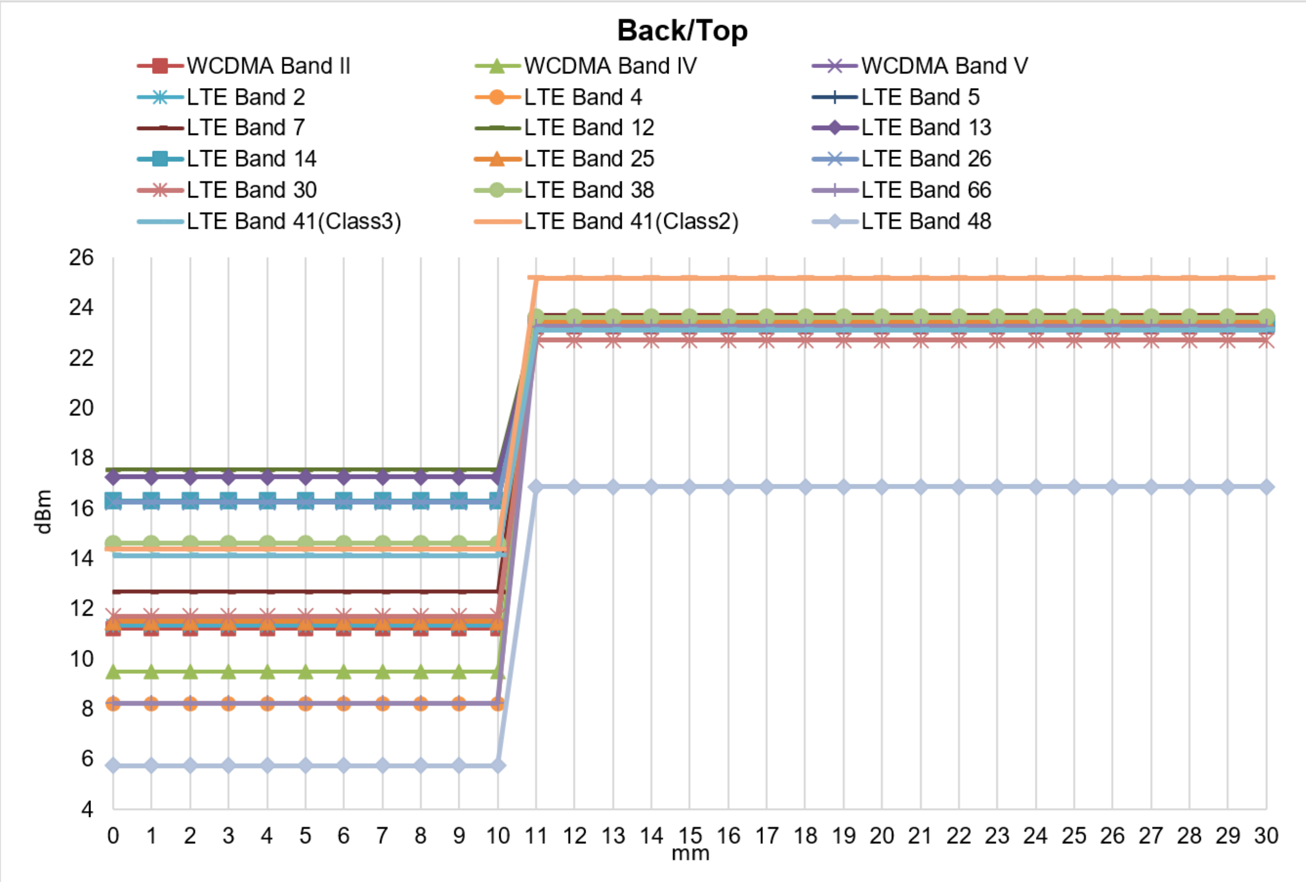
Note:

SAR tests with proximity sensor power reduction are only required for the sides of frequency bands in the table above. For the other sides or other frequency bands of the device, SAR is still tested at the maximum power level with sensor off.

- DUT Moving Toward (Trigger) the Phantom:



- DUT Moving Away (Release) from the Phantom



2) Proximity sensor coverage

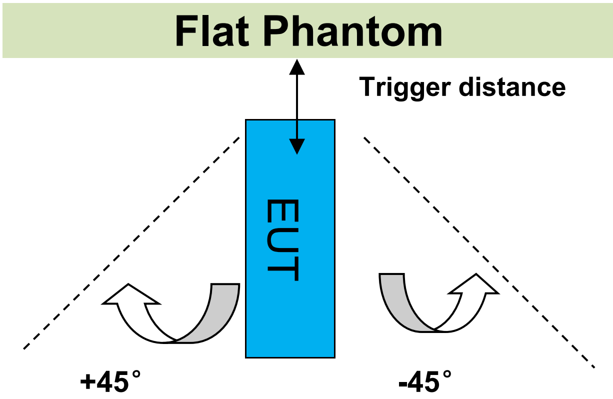
If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For p-sensor coverage testing, the device is moved and “along the direction of maximum antenna and sensor offset”.

The proximity sensor and main antenna use same metallic electrode, so there is no spatial offset.

3) Device tilt angle influences to proximity sensor triggering

The influence of device tilt angles to proximity sensor triggering was determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom.

Rotating the tablet around the edge next to the phantom in ≤ 10° increments until the tablet is ± 45° from the vertical position at 0°, and the maximum output power remains in the reduced mode.



The Sensor Triggering Distance(mm)	
Antenna	Main Ant
Position	Top
Minimum	10

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering for Bottom Side												
Ant	Minimum trigger distance at which power reduction was maintained over ±45°	Power Reduction Status										
		-45°	-35°	-25°	-15°	-5°	0°	5°	15°	25°	35°	45°
Main Ant	10mm	on	on	on	on	on	on	on	on	on	on	on

12 System Verification

12.1 Tissue Verification

The Conductivity (σ) and Permittivity (ρ) are listed in bellow table. The temperature variation of the Tissue Simulate Liquids was 22±2°C, the liquid depth of the ear reference point or the flat phantom was at least 15 cm (which is shown in Figure 12-1).

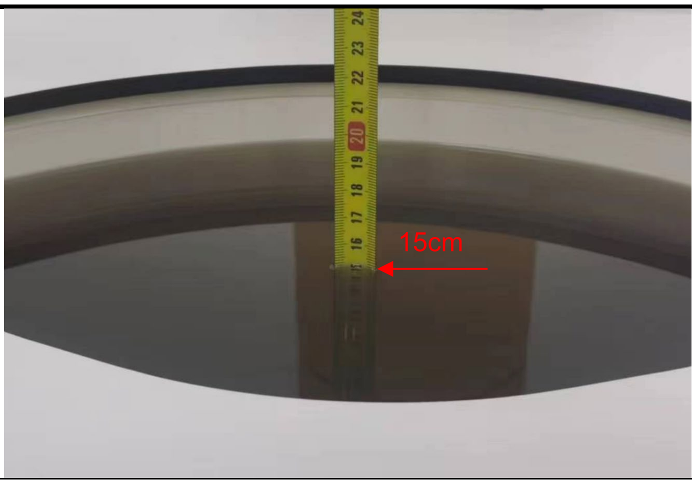


Figure 12-1 Liquid depth in the Flat Phantom

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Target Tissue		Measured Tissue		Deviation (Limit ±5%)		Date
			Permittivity ε_r	Conductivity σ(S/m)	Permittivity ε_r	Conductivity σ(S/m)	$\Delta\varepsilon_r$	Δσ	
13	Head	22.1	55.00	0.75	55.900	0.764	1.64%	1.87%	2025/01/02
750	Head	21.9	41.90	0.89	42.500	0.895	1.43%	0.56%	2024/12/15
835	Head	21.9	41.50	0.90	41.900	0.918	0.96%	2.00%	2024/12/15
1750	Head	22.2	40.10	1.37	40.100	1.380	0.00%	0.73%	2024/12/18
1950	Head	22.2	40.00	1.40	40.300	1.410	0.75%	0.71%	2024/12/18
2300	Head	21.9	39.50	1.67	39.300	1.670	-0.51%	0.00%	2024/12/22
2450	Head	22.2	39.20	1.80	39.700	1.810	1.28%	0.56%	2024/11/07
2600	Head	22.2	39.00	1.96	39.000	1.990	0.00%	1.53%	2024/12/22
3500	Head	22.1	37.90	2.91	38.200	2.890	0.79%	-0.69%	2025/01/06
3700	Head	22.1	37.70	3.12	38.000	3.110	0.80%	-0.32%	2025/01/06
5200	Head	22.3	36.00	4.66	35.700	4.640	-0.83%	-0.43%	2024/11/08
5300	Head	22.3	35.90	4.76	35.700	4.750	-0.56%	-0.21%	2024/11/08
5600	Head	22.3	35.50	5.07	34.700	5.110	-2.25%	0.79%	2024/11/08
5800	Head	22.3	35.30	5.27	34.600	5.280	-1.98%	0.19%	2024/11/08

Table 2: Measurement Tissue Parameters

12.2 SAR System Check

Prior to SAR assessment, a SAR system Check measurement was performed to see if the measured SAR was within ±10% from the target SAR values. The System Performance Check Setup in Figure 12-3.

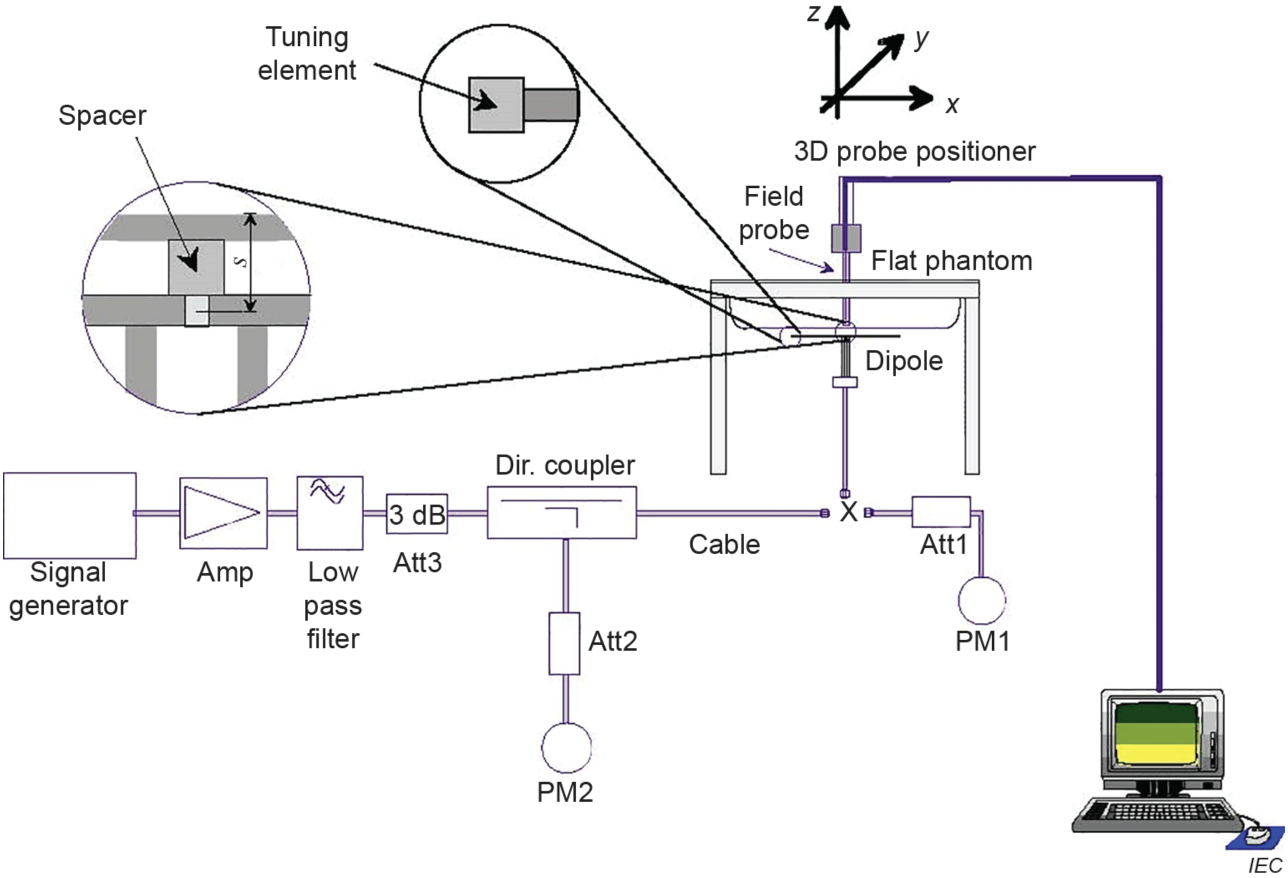


Figure 12-3 System Performance Check Setup

12.2.1 System Check Result

Frequency (MHz)	Tissue Type	Dipole	S/N	Target SAR (1W)		Measured SAR (250mW)		Measured SAR (normalized to 1W)		Deviation (Limit ±10%)		Date
				1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	Δ1g	Δ10g	
750	Head	D750V3	1231	8.67	5.67	2.10	1.38	8.40	5.52	-3.11%	-2.65%	2024/12/15
835	Head	D835V2	4d302	9.78	6.37	2.39	1.55	9.56	6.20	-2.25%	-2.67%	2024/12/15
1750	Head	D1750V2	1115	36.90	19.50	8.89	4.74	35.56	18.96	-3.63%	-2.77%	2024/12/18
1950	Head	D1950V3	1266	40.60	20.80	9.96	5.11	39.84	20.44	-1.87%	-1.73%	2024/12/18
Frequency (MHz)	Tissue Type	Dipole	S/N	Target SAR (1W)		Measured SAR (100mW)		Measured SAR (normalized to 1W)		Deviation (Limit ±10%)		Date
				1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	Δ1g	Δ10g	
13	Head	CLA13	1043	0.484	0.297	0.049	0.031	0.49	0.31	1.24%	4.38%	2025/01/02
2300	Head	D2300V2	1137	49.3	24.00	4.75	2.27	47.50	22.70	-3.65%	-5.42%	2024/12/22
2450	Head	D2450V2	1099	51.40	23.90	4.96	2.33	49.60	23.30	-3.50%	-2.51%	2024/11/07
2600	Head	D2600V2	1094	56.30	25.00	5.89	2.64	58.90	26.40	4.62%	5.60%	2024/12/22
3500	Head	D3500V2	1150	66.30	25.10	7.03	2.72	70.30	27.20	6.03%	8.37%	2025/01/06
3700	Head	D3700V2	1127	66.60	24.10	6.79	2.53	67.90	25.30	1.95%	4.98%	2025/01/06
5200	Head	D5GHzV2	1371	78.90	22.40	7.98	2.29	79.80	22.90	1.14%	2.23%	2024/11/08
5300	Head	D5GHzV2	1371	80.90	23.10	7.74	2.21	77.40	22.10	-4.33%	-4.33%	2024/11/08
5600	Head	D5GHzV2	1371	82.30	23.30	8.60	2.43	86.00	24.30	4.50%	4.29%	2024/11/08
5800	Head	D5GHzV2	1371	79.80	22.40	7.85	2.21	78.50	22.10	-1.63%	-1.34%	2024/11/08

Table 3: SAR System Check Result

12.2.2 Detailed System Check Result

Please see Appendix A

13 SAR General Measurement Procedures

13.1 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tune-up tolerance specified for production units in a secondary mode is ⩽ 0.25 dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is ⩽ 1.2 W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.

13.2 SAR Measurement Conditions for UMTS

13.2.1 Output Power Verification

Maximum output power is verified on the high, middle and low channels according to procedures described in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1’s” for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) are required in the SAR report. All configurations that are not supported by the handset or cannot be measured due to technical or equipment limitations must be clearly identified.

13.2.2 Body SAR Measurements

SAR for body configurations is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple $DPDCH_n$ configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spearing code or $DPDCH_n$, for the highest reported SAR configuration in 12.2 kbps RMC.

13.2.3 SAR Measurements with Rel. 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSDPA is measured using and FRC with H-SET 1 in Sub-test and a 12.2 kbps RMC without HSDPA. Handsets with both HSDPA and HSUPA are tested according to release 6 HSPA test procedures. 8.4.5 SAR Measurement with Rel.6 HSUPA The 3G SAR test Reduction Procedure is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSPA is measured with E-DCH Sub-test 5, Using H-Set 1 and QPSK for FRC and a 12.2kbps RMC configured in Test Loop Mode 1 and Power Control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing.

13.2.4 SAR Measurements with Rel. 6 HSUPA

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA.

When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing.

13.2.5 SAR Measurement Conditions for DC-HSDPA

SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

13.2.6 SAR Measurement Conditions for HSPA+(16QAM)

Per KDB 941225D01, SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode. Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.

- **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	β_{ed}1: 30/15 β_{ed}2: 30/15	β_{ed}3: 24/15 β_{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 signalled to use the extrapolation algorithm.

13.3 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C/MT8821C simulators are used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

13.3.1 Spectrum Plots for RB Configurations

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

13.3.2 MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

Modulation	Channel bandwidth/Transmission bandwidth						MPR (dB)
	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1
16QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1
16QAM	> 5	> 4	> 8	> 12	> 16	> 18	2
64QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	2
64QAM	> 5	> 4	> 8	> 12	> 16	> 18	3
256QAM	≥1						5

13.3.3 A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

13.3.4 Largest channel bandwidth standalone SAR test requirements

A. QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

B. QPSK with 50% RB allocation

The procedures required for 1 RB allocation in A are applied to measure the SAR for QPSK with 50% RB allocation.

C. QPSK with 100% RB allocation

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 in A and B 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.

D. Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in A, B, and C to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

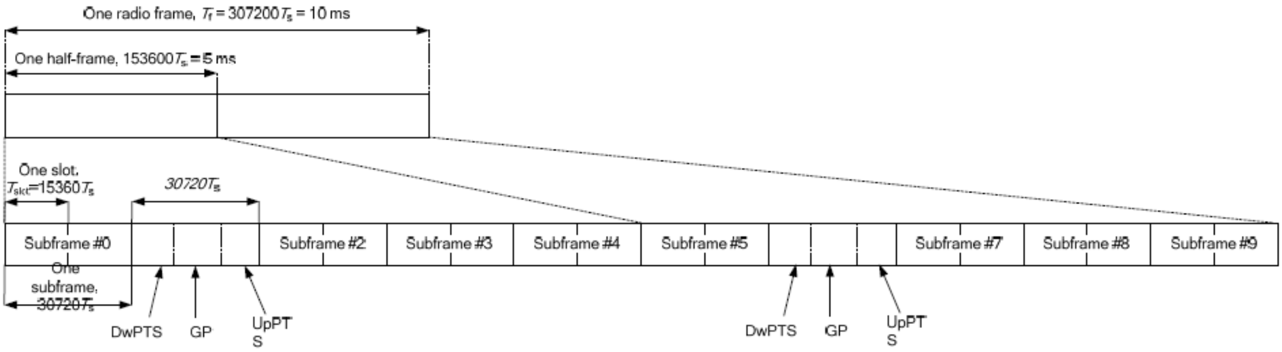
13.3.5 Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in 13.4.4 to determine the channels and RB configurations that need SAR testing, then only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration, or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

13.3.6 LTE TDD Considerations

For Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.
SAR was tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7.
LTE TDD Band support 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special subframe configurations.

Frame structure type 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

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. T_s	2192.T_s	2560.T_s	7680.T_s	2192.T_s	2560.T_s
1	19760.T_s			20480.T_s		
2	21952.T_s			23040.T_s		
3	24144.T_s			25600.T_s		
4	26336.T_s			7680.T_s	4384.T_s	5120.T_s
5	6592.T_s	4384.T_s	5120.T_s	20480.T_s		
6	19760.T_s			23040.T_s		
7	21952.T_s			25600.T_s		
8	24144.T_s			-	-	-
9	13168.T_s			-	-	-

Calculated Duty Cycle=[Extended cyclic prefix in uplink x (Ts) x # of S + # of U]/10ms

Uplink-Downlink Configuration	Downlink-to- Uplink Switch-point Periodicity	Subframe Number										Calculated Duty Cycle (%)
		0	1	2	3	4	5	6	7	8	9	
0	5 ms	D	S	U	U	U	D	S	U	U	U	63.33
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.33
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.33
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.67
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.67
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.67
6	5 ms	D	S	U	U	U	D	S	U	U	D	53.33

Example for calculated Duty Cycle for Uplink-Downlink Configuration 0:
Calculated Duty Cycle = (5120 x (1/(15000 x 2048)) x 2 + 0.006)/0.01 = 63.33 %
Where
Ts = 1/(15000 x 2048) seconds
HPUE:
Calculated Duty Cycle for Uplink-Downlink Configuration 1:
Calculated Duty Cycle =5120*(1/(15000*2048))*2+0.004)/0.01 = 43.33 %

13.4 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01 for more details.

A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement.

For WiFi SAR testing, a communication link is set up with some command for WiFi mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Per KDB248227 D01, a minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

13.4.1 Initial Test Position Procedure

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. The initial test position procedure is described in the following:

1. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).
2. When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.
3. For all positions/configurations tested using the initial test position and subsequent test positions, 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. a) Additional power measurements may be required for this step, which should be limited to those necessary for identifying the subsequent highest output power channels.

13.4.2 Initial Test Configuration Procedure

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required. SAR test reduction for subsequent highest output test channels is determined according to reported SAR of the initial test configuration.
For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration.
When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg or all required channels are tested.

13.4.3 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency Band and aggregated Band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position on procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg for 1g SAR and ≤ 3.0 W/kg for 10g SAR, no additional SAR tests for the subsequent test configurations are required.

13.4.4 2.4 GHz SAR Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions.

A) 802.11b DSSS SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1. When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS is that exposure configuration.

2. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

B) 2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3 of of KDB248227 D01). SAR is not required for the following 2.4 GHz OFDM conditions.

1. When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.

2. 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.

C) SAR Test Requirements for OFDM configurations

When SAR measurement is required for 802.11 g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

13.4.5 5 GHz SAR Procedures

13.4.5.1 U-NII-1 and U-NII-2A Bands

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following:

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.
2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.
3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

13.4.5.2 U-NII-2C and U-NII-3 Bands

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures.

When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

13.4.6 OFDM Transmission Mode and SAR Test Channel Selection

When the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel bandwidth, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. When the maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

13.4.7 MIMO SAR Considerations

Per KDB 248227 D01, the simultaneous SAR provisions in KDB 447498 D01v06 should be applied to determine simultaneous transmission SAR test exclusion for WIFI MIMO. If the sum of 1g single transmission chain SAR measurements is <1.6 W/kg, no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

14 Conducted Power

Note: The detailed conducted power table can refer to Appendix E.

15 SAR Data Summary

General Notes:

1) The Highest Reported SAR Plot refer to Appendix B.

2) Per KDB 447498 D01, testing of other required channels within the operating mode of a frequency band is not required when the reported 1g or 10g SAR for the mid-band or highest output power channel is:

- ≤ 0.8W/kg for 1g or 2.0W/kg for 10g respectively, when the transmission band is ≤ 100MHz.
- ≤ 0.6 W/kg or 1.5 W/kg, for 1g or 10g respectively, when the transmission band is between 100 MHz and 200MHz.
- ≤ 0.4 W/kg or 1.0 W/kg, for 1g or 10g respectively, when the transmission band is ≥ 200MHz.

WiFi 5G Notes:

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. As the highest reported SAR for a test configuration is ⩽ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration.

2) For Wi-Fi 5G, U-NII-2A (5250-5350 MHz) and U-NII-2C (5470-5725 MHz) bands does not support hotspot function.

When the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ⩽ 1.2 W/kg, SAR test for the other 802.11 modes are not required.

15.1 SAR Measurement Result of WCDMA Band II

Test position	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm Sensor On								
Back side	RMC	9400/1880	0.215	0.09	11.23	12.00	1.194	0.257
Top side	RMC	9400/1880	0.058	0.00	11.23	12.00	1.194	0.069
Body Sensor Off								
Back side-9mm	RMC	9400/1880	0.401	0.07	23.26	24.00	1.186	**0.475**
Left side-0mm	RMC	9400/1880	0.201	0.05	23.26	24.00	1.186	0.238
Top side-9mm	RMC	9400/1880	0.147	0.00	23.26	24.00	1.186	0.174
Back side-9mm	RMC	9262/1852.4	0.357	0.00	23.25	24.00	1.189	0.424
Back side-9mm	RMC	9538/1907.6	0.356	0.11	23.10	24.00	1.230	0.438

Table 4: SAR of WCDMA Band II.

15.2 SAR Measurement Result of WCDMA Band IV

Test position	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm Sensor On								
Back side	RMC	1412/1732.4	0.215	0.09	9.49	10.00	1.125	0.242
Top side	RMC	1412/1732.4	0.093	0.01	9.49	10.00	1.125	0.105
Body Sensor Off								
Back side-9mm	RMC	1412/1732.4	1.060	0.00	23.47	23.50	1.007	**1.067**
Back side-9mm repeat	RMC	1412/1732.4	1.030	0.04	23.47	23.50	1.007	1.037
Left side-0mm	RMC	1412/1732.4	0.327	0.07	23.47	23.50	1.007	0.329
Top side-9mm	RMC	1412/1732.4	0.380	0.09	23.47	23.50	1.007	0.383
Back side-9mm	RMC	1312/1712.4	0.911	0.02	23.46	23.50	1.009	0.919
Back side-9mm	RMC	1513/1752.6	1.030	0.00	23.41	23.50	1.021	1.052

Table 5: SAR of WCDMA Band IV.

Test Position	Channel/ Frequency (MHz)	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	3rd Repeated SAR (1g)
Back side-9mm	1412/1732.4	1.060	1.030	1.029	N/A	N/A
Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurement was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).						
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.						
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg						

15.3 SAR Measurement Result of WCDMA Band V

Test position	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm Sensor On								
Back side	RMC	4182/836.4	0.251	0.00	16.31	17.00	1.172	**0.294**
Top side	RMC	4182/836.4	0.076	0.03	16.31	17.00	1.172	0.089
Back side	RMC	4132/826.4	0.198	0.08	16.28	17.00	1.180	0.234
Back side	RMC	4233/846.6	0.210	0.04	16.26	17.00	1.186	0.249
Body 9mm Sensor Off								
Back side-9mm	RMC	4182/836.4	0.181	0.01	23.34	24.00	1.164	0.211
Left side-0mm	RMC	4182/836.4	0.009	0.00	23.34	24.00	1.164	0.010
Top side-9mm	RMC	4182/836.4	0.058	-0.02	23.34	24.00	1.164	0.068

Table 6: SAR of WCDMA Band V.

15.4 SAR Measurement Result of LTE Band 7

Test position	BW. (MHz)	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm 1RB Sensor On									
Back side	20	QPSK 1_0	21100/2535	0.278	0.00	12.68	13.00	1.076	0.299
Top side	20	QPSK 1_0	21100/2535	0.119	0.00	12.68	13.00	1.076	0.128
Body 0mm 50%RB Sensor On									
Back side	20	QPSK 50_25	21100/2535	0.270	0.04	11.69	12.00	1.074	0.290
Top side	20	QPSK 50_25	21100/2535	0.116	0.00	11.69	12.00	1.074	0.125
Body 1RB Sensor Off									
Back side-9mm	20	QPSK 1_0	21100/2535	0.351	-0.05	23.70	24.00	1.072	**0.376**
Left side-0mm	20	QPSK 1_0	21100/2535	0.132	0.00	23.70	24.00	1.072	0.141
Top side-9mm	20	QPSK 1_0	21100/2535	0.240	0.00	23.70	24.00	1.072	0.257
Back side-9mm	20	QPSK 1_0	20850/2510	0.252	0.04	23.69	24.00	1.074	0.271
Back side-9mm	20	QPSK 1_0	21350/2560	0.244	0.01	23.10	24.00	1.230	0.300
Body 50%RB Sensor Off									
Back side-9mm	20	QPSK 50_25	21100/2535	0.297	0.07	22.67	23.00	1.079	0.320
Left side-0mm	20	QPSK 50_25	21100/2535	0.072	0.00	22.67	23.00	1.079	0.078
Top side-9mm	20	QPSK 50_25	21100/2535	0.111	0.06	22.67	23.00	1.079	0.120

Table 7： SAR of LTE Band 7.

15.5 SAR Measurement Result of LTE Band 12

Test position	BW. (MHz)	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm 1RB Sensor On									
Back side	10	QPSK 1_0	23095/707.5	0.283	0.00	17.55	18.00	1.109	0.314
Top side	10	QPSK 1_0	23095/707.5	0.105	0.08	17.55	18.00	1.109	0.116
Body 0mm 50%RB Sensor On									
Back side	10	QPSK 25_13	23095/707.5	0.214	0.00	16.43	17.00	1.140	0.244
Top side	10	QPSK 25_13	23095/707.5	0.096	0.05	16.43	17.00	1.140	0.109
Body 1RB Sensor Off									
Back side-9mm	10	QPSK 1_0	23095/707.5	0.337	0.08	23.52	24.00	1.117	0.376
Left side-0mm	10	QPSK 1_0	23095/707.5	0.011	0.06	23.52	24.00	1.117	0.012
Top side-9mm	10	QPSK 1_0	23095/707.5	0.055	0.03	23.52	24.00	1.117	0.061
Back side-9mm	10	QPSK 1_0	23060/704	0.336	0.03	23.45	24.00	1.135	**0.381**
Back side-9mm	10	QPSK 1_0	23130/711	0.334	0.01	23.48	24.00	1.127	0.376
Body 50%RB Sensor Off									
Back side-9mm	10	QPSK 25_13	23095/707.5	0.267	0.03	22.39	23.00	1.151	0.307
Left side-0mm	10	QPSK 25_13	23095/707.5	0.010	0.05	22.39	23.00	1.151	0.012
Top side-9mm	10	QPSK 25_13	23095/707.5	0.042	0.06	22.39	23.00	1.151	0.048

Table 8： SAR of LTE Band 12.

15.6 SAR Measurement Result of LTE Band 13

Test position	BW. (MHz)	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm 1RB Sensor On									
Back side	10	QPSK 1_25	23230/782	0.218	0.07	17.26	18.00	1.186	0.258
Top side	10	QPSK 1_25	23230/782	0.089	0.02	17.26	18.00	1.186	0.106
Body 0mm 50%RB Sensor On									
Back side	10	QPSK 25_0	23230/782	0.210	0.01	16.24	17.00	1.191	0.250
Top side	10	QPSK 25_0	23230/782	0.088	0.01	16.24	17.00	1.191	0.105
Body 1RB Sensor Off									
Back side-9mm	10	QPSK 1_25	23230/782	0.246	0.07	23.28	24.00	1.180	**0.290**
Left side-0mm	10	QPSK 1_25	23230/782	0.014	0.09	23.28	24.00	1.180	0.017
Top side-9mm	10	QPSK 1_25	23230/782	0.042	0.06	23.28	24.00	1.180	0.050
Body 50%RB Sensor Off									
Back side-9mm	10	QPSK 25_0	23230/782	0.193	0.02	22.26	23.00	1.186	0.229
Left side-0mm	10	QPSK 25_0	23230/782	0.010	0.07	22.26	23.00	1.186	0.012
Top side-9mm	10	QPSK 25_0	23230/782	0.034	0.01	22.26	23.00	1.186	0.040

Table 9： SAR of LTE Band 13.

15.7 SAR Measurement Result of LTE Band 14

Test position	BW. (MHz)	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm 1RB Sensor On									
Back side	10	QPSK 1_25	23330/793	0.185	0.06	16.30	17.00	1.175	0.217
Top side	10	QPSK 1_25	23330/793	0.078	0.05	16.30	17.00	1.175	0.092
Body 0mm 50%RB Sensor On									
Back side	10	QPSK 25_13	23330/793	0.183	0.04	15.21	16.00	1.199	0.220
Top side	10	QPSK 25_13	23330/793	0.075	0.04	15.21	16.00	1.199	0.090
Body 1RB Sensor Off									
Back side-9mm	10	QPSK 1_25	23330/793	0.247	0.07	23.35	24.00	1.161	**0.287**
Left side-0mm	10	QPSK 1_25	23330/793	0.017	0.01	23.35	24.00	1.161	0.020
Top side-9mm	10	QPSK 1_25	23330/793	0.049	0.02	23.35	24.00	1.161	0.057
Body 50%RB Sensor Off									
Back side-9mm	10	QPSK 25_13	23330/793	0.205	0.01	22.24	23.00	1.191	0.017
Left side-0mm	10	QPSK 25_13	23330/793	0.014	0.00	22.24	23.00	1.191	0.044
Top side-9mm	10	QPSK 25_13	23330/793	0.037	0.02	22.24	23.00	1.191	0.044

Table 10：SAR of LTE Band 14.

15.8 SAR Measurement Result of LTE Band 25

Test position	BW. (MHz)	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm 1RB Sensor On									
Back side	20	QPSK 1_0	26365/1882.5	0.229	0.09	11.50	12.00	1.122	0.257
Top side	20	QPSK 1_0	26365/1882.5	0.056	0.00	11.50	12.00	1.122	0.063
Body 0mm 50%RB Sensor On									
Back side	20	QPSK 50_25	26365/1882.5	0.223	0.03	10.47	11.00	1.130	0.252
Top side	20	QPSK 50_25	26365/1882.5	0.052	0.00	10.47	11.00	1.130	0.059
Body 1RB Sensor Off									
Back side-9mm	20	QPSK 1_0	26365/1882.5	0.483	0.02	23.48	24.00	1.127	0.544
Left side-0mm	20	QPSK 1_0	26365/1882.5	0.304	0.00	23.48	24.00	1.127	0.343
Top side-9mm	20	QPSK 1_0	26365/1882.5	0.162	0.00	23.48	24.00	1.127	0.183
Back side-9mm	20	QPSK 1_0	26140/1860	0.441	0.00	23.25	24.00	1.189	0.524
Back side-9mm	20	QPSK 1_0	26590/1905	0.466	0.05	23.26	24.00	1.186	**0.553**
Body 50%RB Sensor Off									
Back side-9mm	20	QPSK 50_25	26365/1882.5	0.368	-0.02	22.42	23.00	1.143	0.421
Left side-0mm	20	QPSK 50_25	26365/1882.5	0.275	0.09	22.42	23.00	1.143	0.314
Top side-9mm	20	QPSK 50_25	26365/1882.5	0.129	0.00	22.42	23.00	1.143	0.147

Table 11：SAR of LTE Band 25.

15.9 SAR Measurement Result of LTE Band 26

Test position	BW. (MHz)	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm 1RB Sensor On									
Back side	15	QPSK 1_0	26765/821.5	0.219	0.02	16.27	17.00	1.183	0.259
Top side	15	QPSK 1_0	26765/821.5	0.063	0.09	16.27	17.00	1.183	0.075
Back side	15	QPSK 1_0	26865/831.5	0.203	0.06	16.24	17.00	1.191	0.242
Back side	15	QPSK 1_0	26965/841.5	0.277	0.02	16.25	17.00	1.189	**0.329**
Body 0mm 50%RB Sensor On									
Back side	15	QPSK 36_18	26765/821.5	0.214	0.01	15.31	16.00	1.172	0.251
Top side	15	QPSK 36_18	26765/821.5	0.061	0.08	15.31	16.00	1.172	0.072
Body 1RB Sensor Off									
Back side-9mm	15	QPSK 1_0	26765/821.5	0.198	0.06	23.28	24.00	1.180	0.234
Left side-0mm	15	QPSK 1_0	26765/821.5	0.011	0.07	23.28	24.00	1.180	0.013
Top side-9mm	15	QPSK 1_0	26765/821.5	0.046	0.04	23.28	24.00	1.180	0.054
Body 50%RB Sensor Off									
Back side-9mm	15	QPSK 36_18	26765/821.5	0.156	0.07	22.28	23.00	1.180	0.184
Left side-0mm	15	QPSK 36_18	26765/821.5	0.010	0.00	22.28	23.00	1.180	0.012
Top side-9mm	15	QPSK 36_18	26765/821.5	0.040	0.00	22.28	23.00	1.180	0.047

Table 12： SAR of LTE Band 26.

15.10SAR Measurement Result of LTE Band 30

Test position	BW. (MHz)	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm 1RB Sensor On									
Back side	10	QPSK 1_25	27710/2310	0.202	0.09	11.71	13.00	1.346	0.272
Top side	10	QPSK 1_25	27710/2310	0.089	-0.05	11.71	13.00	1.346	0.120
Body 0mm 50%RB Sensor On									
Back side	10	QPSK 25_13	27710/2310	0.197	0.00	10.74	12.00	1.337	0.263
Top side	10	QPSK 25_13	27710/2310	0.084	0.02	10.74	12.00	1.337	0.112
Body 1RB Sensor Off									
Back side-9mm	10	QPSK 1_25	27710/2310	0.475	0.03	22.75	24.00	1.334	**0.633**
Left side-0mm	10	QPSK 1_25	27710/2310	0.247	0.04	22.75	24.00	1.334	0.329
Top side-9mm	10	QPSK 1_25	27710/2310	0.169	0.01	22.75	24.00	1.334	0.225
Body 50%RB Sensor Off									
Back side-9mm	10	QPSK 25_13	27710/2310	0.377	0.00	21.70	23.00	1.349	0.235
Left side-0mm	10	QPSK 25_13	27710/2310	0.174	0.03	21.70	23.00	1.349	0.189
Top side-9mm	10	QPSK 25_13	27710/2310	0.140	0.00	21.70	23.00	1.349	0.189

Table 13： SAR of LTE Band 30.

15.11SAR Measurement Result of LTE Band 41

Test position	BW. (MHz)	Mode	Duty Cycle	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm 1RB Sensor On										
Back side	20	QPSK 1_0	1:1.58	39750/2506	0.215	0.02	14.13	15.00	1.222	0.263
Top side	20	QPSK 1_0	1:1.58	39750/2506	0.095	0.00	14.13	15.00	1.222	0.116
Back side	20	QPSK 1_0	1:1.58	40185/2549.5	0.233	0.00	13.80	15.00	1.318	0.307
Back side	20	QPSK 1_0	1:1.58	40620/2593	0.241	-0.09	13.78	15.00	1.324	**0.319**
Back side	20	QPSK PCC 1_0 QPSK SCC 1_99	1:1.58	40620/2593 40422/2573.2	0.193	0.10	14.98	15.00	1.005	0.194
Back side class2	20	QPSK 1_0	1:2.31	40620/2593	0.201	0.04	14.37	15.00	1.156	0.232
Back side	20	QPSK 1_0	1:1.58	41055/2636.5	0.213	-0.01	13.80	15.00	1.318	0.281
Back side	20	QPSK 1_0	1:1.58	41490/2680	0.219	-0.02	13.55	15.00	1.396	0.306
Body 0mm 50%RB Sensor On										
Back side	20	QPSK 50_25	1:1.58	39750/2506	0.214	0.11	13.21	14.00	1.199	0.257
Top side	20	QPSK 50_25	1:1.58	39750/2506	0.092	0.00	13.21	14.00	1.199	0.110
Body 1RB Sensor Off										
Back side-9mm	20	QPSK 1_0	1:1.58	39750/2506	0.153	0.03	23.12	24.00	1.225	0.187
Left side-0mm	20	QPSK 1_0	1:1.58	39750/2506	0.081	0.00	23.12	24.00	1.225	0.099
Top side-9mm	20	QPSK 1_0	1:1.58	39750/2506	0.106	-0.01	23.12	24.00	1.225	0.130
Body 50%RB Sensor Off										
Back side-9mm	20	QPSK 50_25	1:1.58	39750/2506	0.133	0.00	22.16	23.00	1.213	0.161
Left side-0mm	20	QPSK 50_25	1:1.58	39750/2506	0.056	-0.06	22.16	23.00	1.213	0.068
Top side-9mm	20	QPSK 50_25	1:1.58	39750/2506	0.064	0.03	22.16	23.00	1.213	0.078

Table 14： SAR of LTE Band 41.

LTE Band 41 Power Class 2 and Power Class 3 Linearity:

This device supports Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operations is 43.3 % using UL-DL configuration 1. Per May 2017 TCB Workshop Notes based on the device behavior, all SAR tests were performed using Power Class 3. SAR with Power Class 2 with the highest power and available duty factor was additionally performed for the Power Class 3 configuration with the highest SAR for each exposure condition. The linearity between Power Class 2 and Power Class 3 SAR results and the respective frame averaged powers were calculated to determine that the results were linear.

Per May 2017 TCB Workshop, no additional SAR measurements were required since the linearity between power classes was < 10% and all reported SAR values were < 1.4 W/kg for 1g and < 3.5 W/kg for 10g.

LTE Band 41 SAR testing with power class 2 at the highest power and available duty factor was additionally performed for the power class 3 configuration with the highest SAR for each exposure condition.
LTE Band 41 Linearity Data:

	Power Class 3	Power Class 2
Tune-up(dBm)	15.00	15.00
Measured power(dBm)	13.78	14.37
Measured SAR(W/kg)	0.241	0.201
Measured power(mw)	23.88	27.35
Duty Cycle	63.3%	43.3%
Frame Average power(mw)	15.11	11.84
% deviation from expected linearity		6.44%

15.12SAR Measurement Result of LTE Band 48

Test position	BW. (MHz)	Mode	Duty Cycle	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm 1RB Sensor On										
Back side	20	QPSK 1_99	1:1.58	55340/3560	0.181	0.06	5.75	7.00	1.334	0.241
Top side	20	QPSK 1_99	1:1.58	55340/3560	0.062	0.03	5.75	7.00	1.334	0.083
Body 0mm 50%RB Sensor On										
Back side	20	QPSK 50_25	1:1.58	55340/3560	0.131	0.03	4.85	6.00	1.303	0.171
Top side	20	QPSK 50_25	1:1.58	55340/3560	0.049	0.01	4.85	6.00	1.303	0.064
Body 1RB Sensor Off										
Back side-9mm	20	QPSK 1_99	1:1.58	55340/3560	0.353	0.00	16.86	18.00	1.300	0.459
Left side-0mm	20	QPSK 1_99	1:1.58	55340/3560	0.033	0.14	16.86	18.00	1.300	0.043
Top side-9mm	20	QPSK 1_99	1:1.58	55340/3560	0.179	0.07	16.86	18.00	1.300	0.233
Back side	20	QPSK 1_99	1:1.58	55773/3603.3	0.342	-0.09	16.73	18.00	1.340	0.458
Back side	20	QPSK 1_99	1:1.58	56207/3646.7	0.384	0.00	16.74	18.00	1.337	0.513
Back side	20	QPSK 1_99	1:1.58	56640/3690	0.426	0.00	16.82	18.00	1.312	**0.559**
Body 50%RB Sensor Off										
Back side-9mm	20	QPSK 50_25	1:1.58	55340/3560	0.277	0.04	15.98	17.00	1.265	0.350
Left side-0mm	20	QPSK 50_25	1:1.58	55340/3560	0.032	0.00	15.98	17.00	1.265	0.040
Top side-9mm	20	QPSK 50_25	1:1.58	55340/3560	0.141	0.00	15.98	17.00	1.265	0.178

Table 15： SAR of LTE Band 48.

15.13 SAR Measurement Result of LTE Band 66

Test position	BW. (MHz)	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm 1RB Sensor On									
Back side	20	QPSK 1_50	132322/1745	0.182	0.02	8.24	9.00	1.191	0.217
Top side	20	QPSK 1_50	132322/1745	0.081	0.00	8.24	9.00	1.191	0.096
Body 0mm 50%RB Sensor On									
Back side	20	QPSK 50_25	132322/1745	0.177	0.08	7.33	8.00	1.167	0.207
Top side	20	QPSK 50_25	132322/1745	0.079	0.00	7.33	8.00	1.167	0.092
Body 1RB Sensor Off									
Back side-9mm	20	QPSK 1_50	132322/1745	1.070	0.04	23.25	23.50	1.059	**1.133**
Back side-9mm Repeated	20	QPSK 1_50	132322/1745	1.010	0.01	23.25	23.50	1.059	1.070
Left side-0mm	20	QPSK 1_50	132322/1745	0.398	0.08	23.25	23.50	1.059	0.422
Top side-9mm	20	QPSK 1_50	132322/1745	0.445	0.00	23.25	23.50	1.059	0.471
Back side-9mm	20	QPSK 1_50	132072/1720	0.980	0.01	23.21	23.50	1.069	1.048
Back side-9mm	20	QPSK 1_50	132572/1770	0.810	0.09	23.16	23.50	1.081	0.876
Body 50%RB Sensor Off									
Back side-9mm	20	QPSK 50_25	132322/1745	0.860	0.00	22.35	22.50	1.035	0.890
Left side-0mm	20	QPSK 50_25	132322/1745	0.312	0.06	22.35	22.50	1.035	0.323
Top side-9mm	20	QPSK 50_25	132322/1745	0.366	0.03	22.35	22.50	1.035	0.379
Back side-9mm	20	QPSK 50_25	132072/1720	0.795	-0.01	22.33	22.50	1.040	0.827
Back side-9mm	20	QPSK 50_25	132572/1770	0.656	0.02	22.23	22.50	1.064	0.698
Body 100%RB Sensor Off									
Back side-9mm	20	QPSK 100_0	132322/1745	0.821	-0.01	22.15	22.50	1.084	0.890

Table 16： SAR of LTE Band 66.

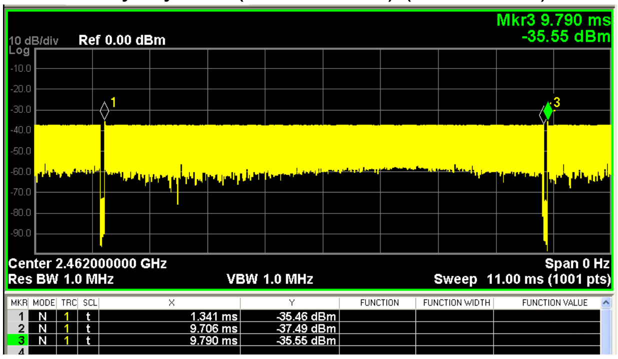
Test Position	Channel/ Frequency (MHz)	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	3rd Repeated SAR (1g)
Back side-9mm	132322/1745	1.070	1.010	1.059	N/A	N/A
Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurement was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).						
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.						
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg						

15.14 SAR Measurement Result of WIFI 2.4G

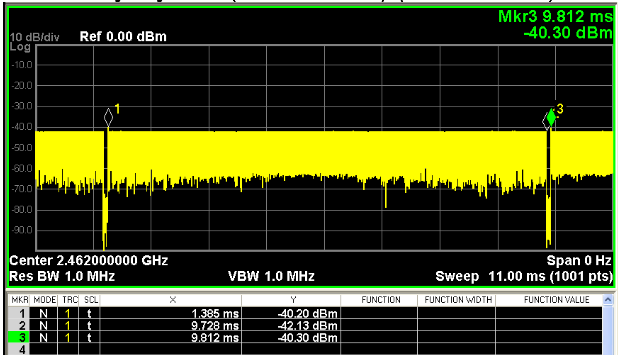
Test position	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	Power Drift (dB)	Duty Cycle	Duty Cycle Scaling Factor	Conducted Power (dBm)	Tune up Limit (dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Ant A Test Results										
Body 0mm										
Back side	802.11b	6/2437	0.320	0.14	99.01%	1.010	8.14	9.00	1.219	0.394
Right side	802.11b	6/2437	0.097	0.03	99.01%	1.010	8.14	9.00	1.219	0.119
Top side	802.11b	6/2437	0.010	0.05	99.01%	1.010	8.14	9.00	1.219	0.012
Back side	802.11b	1/2412	0.301	-0.01	99.01%	1.010	8.01	9.00	1.256	0.382
Back side	802.11b	11/2462	0.370	-0.01	99.01%	1.010	7.96	9.00	1.271	**0.475**
Back side	802.11b	12/2467	0.317	0.00	99.01%	1.010	7.96	9.00	1.271	0.407
Back side	802.11b	13/2472	0.318	-0.11	99.01%	1.010	7.81	9.00	1.315	0.422
Body 9mm										
Back side	802.11b	11/2462	0.031	0.02	99.01%	1.010	7.96	9.00	1.271	0.040
Ant B Test Results										
Test position	**Mode**	**Ch./Freq. (MHz)**	**SAR (W/kg) 1-g**	**Power Drift (dB)**	**Duty Cycle**	**Duty Cycle Scaling Factor**	**Conducted Power (dBm)**	**Tune up Limit (dBm)**	**Scaling Factor**	**Reported 1g SAR (W/kg)**
Body 0mm										
Back side	802.11b	6/2437	0.347	-0.07	99.00%	1.010	7.88	9.00	1.294	**0.454**
Right side	802.11b	6/2437	0.040	0.08	99.00%	1.010	7.88	9.00	1.294	0.052
Top side	802.11b	6/2437	0.005	0.02	99.00%	1.010	7.88	9.00	1.294	0.007
Back side	802.11b	1/2412	0.272	-0.16	99.00%	1.010	7.62	9.00	1.374	0.377
Back side	802.11b	11/2462	0.333	-0.02	99.00%	1.010	7.78	9.00	1.324	0.445
Back side	802.11b	12/2467	0.335	-0.12	99.00%	1.010	7.76	9.00	1.330	0.450
Back side	802.11b	13/2472	0.336	-0.02	99.00%	1.010	7.77	9.00	1.327	0.450
Body 9mm										
Back side	802.11b	6/2437	0.028	0.16	99.00%	1.010	7.88	9.00	1.294	0.037
MIMO(A+B) Test Results										
Test position	**Mode**	**Ch./Freq. (MHz)**	**SAR (W/kg) 1-g**	**Power Drift (dB)**	**Duty Cycle**	**Duty Cycle Scaling Factor**	**Conducted Power (dBm)**	**Tune up Limit (dBm)**	**Scaling Factor**	**Reported 1g SAR (W/kg)**
Body 0mm										
Back side	802.11n 40M	6/2437	0.256	-0.01	99.05%	1.010	11.02	12.0	1.256	0.325
Right side	802.11n 40M	6/2437	0.095	0.03	99.05%	1.010	11.02	12.0	1.256	0.121
Top side	802.11n 40M	6/2437	0.011	0.06	99.05%	1.010	11.02	12.0	1.256	0.014
Back side	802.11n 40M	3/2422	0.283	0.00	99.05%	1.010	10.98	12.0	1.268	0.362
Back side	802.11n 40M	9/2452	0.305	0.01	99.05%	1.010	10.99	12.0	1.265	**0.390**
Back side	802.11n 40M	10/2457	0.296	-0.02	99.05%	1.010	11.01	12.0	1.259	0.376
Back side	802.11n 40M	11/2462	0.293	0.03	99.05%	1.010	11.00	12.0	1.262	0.373
Body 9mm										
Back side	802.11n 40M	9/2452	0.022	-0.01	99.05%	1.010	10.99	12.0	1.265	0.028

Table 17： SAR of WIFI 2.4G.

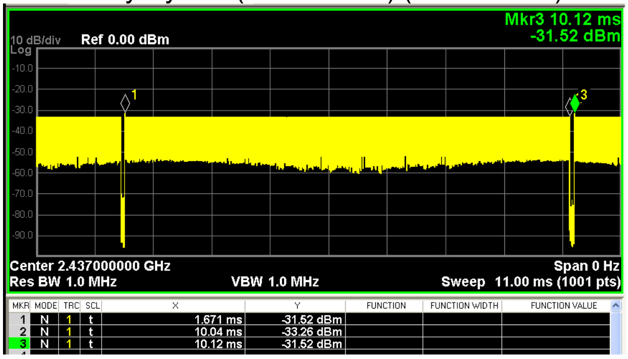
Ant A Duty Cycle= (9.706-1.341)/(9.79-1.341) =99.01%



Ant B Duty Cycle= (9.728-1.385)/(9.812-1.385)=76.8%



MIMO Duty Cycle= (10.04-1.671)/(10.12-1.671) =99.05%



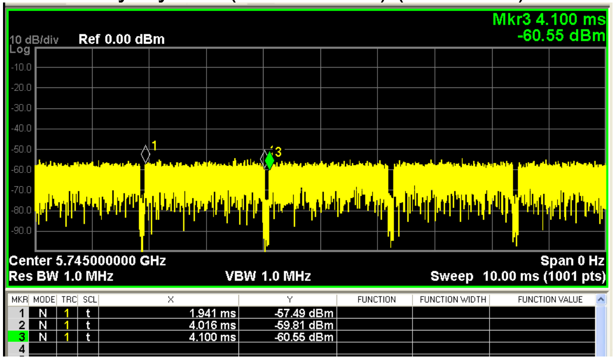
15.15 SAR Measurement Result of WIFI 5G

Ant A Test Results										
Test position	**Mode**	**Ch./Freq. (MHz)**	**SAR (W/kg) 1g**	**Power Drift (dB)**	**Duty Cycle**	**Duty Cycle Scaling Factor**	**Conducted Power(dBm)**	**Tune up Limit(dBm)**	**Scaling Factor**	**Reported 1g SAR (W/kg)**
U-NII-2A Body 0mm										
Back side	802.11a	60/5300	0.240	-0.08	96.11%	1.040	4.66	6.00	1.361	0.340
Right side	802.11a	60/5300	0.100	0.01	96.11%	1.040	4.66	6.00	1.361	0.142
Top side	802.11a	60/5300	0.011	0.03	96.11%	1.040	4.66	6.00	1.361	0.016
Back side	802.11a	52/5260	0.251	-0.09	96.11%	1.040	4.44	6.00	1.432	**0.374**
Back side	802.11a	64/5320	0.243	-0.06	96.11%	1.040	4.60	6.00	1.380	0.349
U-NII-2C Body 0mm										
Back side	802.11a	116/5580	0.245	0.07	96.11%	1.040	4.78	6.00	1.324	0.337
Right side	802.11a	116/5580	0.108	0.00	96.11%	1.040	4.78	6.00	1.324	0.149
Top side	802.11a	116/5580	0.014	0.04	96.11%	1.040	4.78	6.00	1.324	0.019
Back side	802.11a	100/5500	0.217	-0.01	96.11%	1.040	4.54	6.00	1.400	0.316
Back side	802.11a	140/5700	0.298	-0.08	96.11%	1.040	4.73	6.00	1.340	**0.415**
U-NII-3 Body 0mm										
Back side	802.11a	157/5785	0.212	-0.01	96.11%	1.040	4.83	6.00	1.309	0.289
Right side	802.11a	157/5785	0.152	0.00	96.11%	1.040	4.83	6.00	1.309	0.207
Top side	802.11a	157/5785	0.014	0.03	96.11%	1.040	4.83	6.00	1.309	0.019
Back side	802.11a	149/5745	0.308	0.08	96.11%	1.040	4.70	6.00	1.349	**0.432**
Back side	802.11a	165/5825	0.296	-0.04	96.11%	1.040	4.69	6.00	1.352	0.416
Body 9mm										
Back side	802.11a	149/5745	0.069	0.07	96.11%	1.040	4.70	6.00	1.349	0.097
Ant B Test Results										
Test position	**Mode**	**Ch./Freq. (MHz)**	**SAR (W/kg) 1g**	**Power Drift (dB)**	**Duty Cycle**	**Duty Cycle Scaling Factor**	**Conducted Power(dBm)**	**Tune up Limit(dBm)**	**Scaling Factor**	**Reported 1g SAR (W/kg)**
U-NII-2A Body 0mm										
Back side	802.11a	60/5300	0.185	0.00	96.11%	1.040	4.72	6.00	1.343	0.258
Right side	802.11a	60/5300	0.082	0.08	96.11%	1.040	4.72	6.00	1.343	0.115
Top side	802.11a	60/5300	0.007	0.01	96.11%	1.040	4.72	6.00	1.343	0.010
Back side	802.11a	52/5260	0.170	0.01	96.11%	1.040	4.65	6.00	1.365	0.241
Back side	802.11a	64/5320	0.196	-0.09	96.11%	1.040	4.70	6.00	1.349	**0.275**
U-NII-2C Body 0mm										
Back side	802.11a	116/5580	0.442	-0.01	96.11%	1.040	4.90	6.00	1.288	**0.592**
Right side	802.11a	116/5580	0.171	0.04	96.11%	1.040	4.90	6.00	1.288	0.229
Top side	802.11a	116/5580	0.014	0.04	96.11%	1.040	4.90	6.00	1.288	0.019
Back side	802.11a	100/5500	0.338	-0.03	96.11%	1.040	4.76	6.00	1.330	0.468
Back side	802.11a	140/5700	0.429	-0.13	96.11%	1.040	4.89	6.00	1.291	0.576
U-NII-3 Body 0mm										
Back side	802.11a	157/5785	0.397	0.00	96.11%	1.040	4.86	6.00	1.300	0.537
Right side	802.11a	157/5785	0.172	0.05	96.11%	1.040	4.86	6.00	1.300	0.233
Top side	802.11a	157/5785	0.011	0.04	96.11%	1.040	4.86	6.00	1.300	0.015
Back side	802.11a	149/5745	0.439	-0.05	96.11%	1.040	4.82	6.00	1.312	**0.599**
Back side	802.11a	165/5825	0.409	-0.07	96.11%	1.040	4.66	6.00	1.361	0.579
Body 9mm										
Back side	802.11a	149/5745	0.066	0.09	96.11%	1.040	4.82	6.00	1.312	0.090

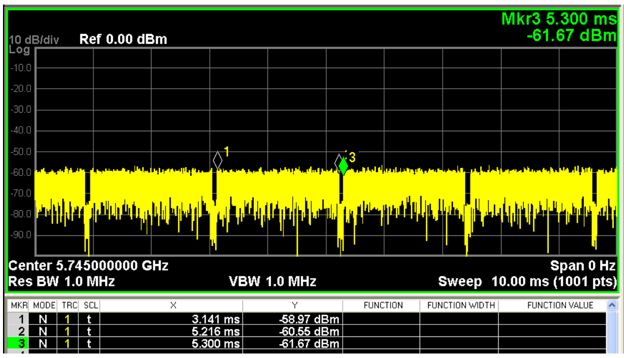
MIMO(A+B) Test Results											
Test position	**Mode**	**Ch./Freq. (MHz)**	**SAR (W/kg) 1g**	**Power Drift (dB)**	**Duty Cycle**	**Duty Cycle Scaling Factor**	**Conducted Power(dBm)**	**Tune up Limit(dBm)**	**Scaling Factor**	**Reported 1g SAR (W/kg)**
U-NII-2A Body 0mm											
Back side	802.11n	60/5300	0.248	-0.05	95.23%	1.050	7.43	8.5	1.279	0.333
Right side	802.11n	60/5300	0.111	0.03	95.23%	1.050	7.43	8.5	1.279	0.149
Top side	802.11n	60/5300	0.014	0.05	95.23%	1.050	7.43	8.5	1.279	0.019
Back side	802.11n	52/5260	0.264	0.07	95.23%	1.050	7.40	8.5	1.288	**0.357**
Back side	802.11n	64/5320	0.263	-0.02	95.23%	1.050	7.41	8.5	1.285	0.355
U-NII-2C Body 0mm											
Back side	802.11n	116/5580	0.423	0.08	95.23%	1.050	7.56	8.5	1.242	0.551
Right side	802.11n	116/5580	0.191	0.01	95.23%	1.050	7.56	8.5	1.242	0.249
Top side	802.11n	116/5580	0.020	0.06	95.23%	1.050	7.56	8.5	1.242	0.026
Back side	802.11n	100/5500	0.332	-0.04	95.23%	1.050	7.51	8.5	1.256	0.438
Back side	802.11n	140/5700	0.440	-0.09	95.23%	1.050	7.52	8.5	1.253	**0.579**
Body 9mm											
Back side	802.11n	140/5700	0.080	0.05	95.23%	1.050	7.52	8.5	1.253	0.105
U-NII-3 Body 0mm											
Back side	802.11n	157/5785	0.414	0.00	95.23%	1.050	7.62	8.5	1.225	0.532
Right side	802.11n	157/5785	0.189	0.02	95.23%	1.050	7.62	8.5	1.225	0.243
Top side	802.11n	157/5785	0.018	0.07	95.23%	1.050	7.62	8.5	1.225	0.023
Back side	802.11n	149/5745	0.447	-0.15	95.23%	1.050	7.61	8.5	1.227	**0.576**
Back side	802.11n	165/5825	0.408	-0.08	95.23%	1.050	7.52	8.5	1.253	0.537

Table 18： SAR of WIFI 5G.

Ant A Duty Cycle= (4.016-1.941)/(4.1-1.941) =96.11%

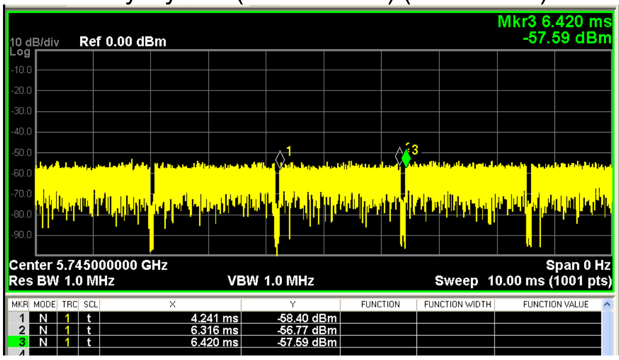


Ant B Duty Cycle= (5.216-3.141)/(5.3-3.141) =96.11%



Ant B Duty Cycle= (4.31-1.43)/(4.31-0.56) =76.8%

MIMO Duty Cycle= (6.316-4.241)/(6.42-4.241) =95.23%

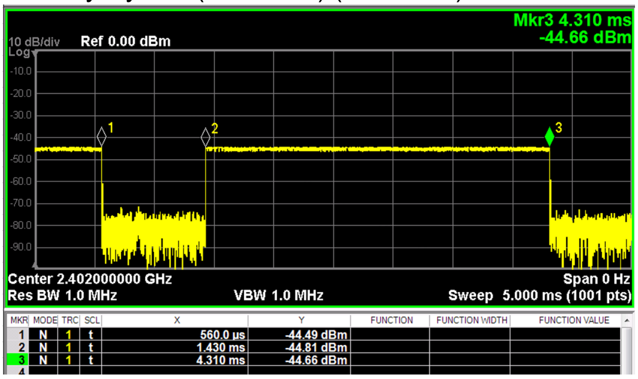


15.16 SAR Measurement Result of BT

Test position	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift (dB)	Duty Cycle	Duty Cycle Scaling Factor	Conducted Power(dBm)	Tune up Limit(dBm)	Scaling Factor	Reported 1g SAR (W/kg)
Body 0mm											
Back side	DH5	39/2441	0.369	0.132	0.09	76.80%	1.302	10.34	11.00	1.164	0.559
Right side	DH5	39/2441	0.100	0.048	0.00	76.80%	1.302	10.34	11.00	1.164	0.152
Top side	DH5	39/2441	0.010	0.005	0.00	76.80%	1.302	10.34	11.00	1.164	0.015
Back side	DH5	0/2402	0.384	0.133	-0.12	76.80%	1.302	10.19	11.00	1.205	**0.602**
Back side	DH5	78/2480	0.346	0.122	-0.05	76.80%	1.302	10.28	11.00	1.180	0.532
Body 9mm											
Back side	DH5	0/2402	0.032	0.014	-0.11	76.80%	1.302	10.08	11.00	1.236	0.051

Table 19： SAR of BT.

BT Duty Cycle= (4.31-1.43)/(4.31-0.56) =76.8%



15.17 SAR Measurement Result of NFC

Test position	Mode	Ch./Freq. (MHz)	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power drift (dB)
Body 0mm					
Back side	NFC	13.56MHz	**0.011**	0.030	0.04
Left side	NFC	13.56MHz	0.000	0.000	0.00
Right side	NFC	13.56MHz	0.001	0.000	0.00
Top side	NFC	13.56MHz	0.000	0.000	0.00
Bottom side	NFC	13.56MHz	0.001	0.000	0.00

Table 20： SAR of NFC.

16 Simultaneous Transmission Analysis

The Simultaneous Transmission Possibilities of this device are as below:

NO.	Simultaneous Tx Combination	Body
1	WWAN + WIFI 2.4G SISO/MIMO	Y
2	WWAN + WIFI 5G SISO/MIMO	Y
3	WWAN + BT	Y
4	WWAN + WIFI 2.4G Ant B + BT	Y
5	WWAN + WIFI 5G Ant B + BT	Y
6	WWAN + WIFI 5G MIMO + BT	Y
7	WIFI 2.4G Ant B + BT	Y
8	WIFI 5G Ant B + BT	Y
9	WIFI 5G MIMO + BT	Y

Test position		Main Antenna SAR_{max} (W/kg)													WiFi/BT Antenna SAR_{max} (W/kg)							Summed SAR_{max}									
		WCDMA Band II	WCDMA Band IV	WCDMA Band V	LTE B2/25	LTE B4/66	LTE B5/26	LTE B7	LTE B12	LTE B13	LTE B14	LTE B30	LTE B38/41	LTE B48	WiFi 2.4G			WiFi 5G			BT										
															Ant A	Ant B	MIMO	Ant A	Ant B	MIMO	Ant A										
		1													2	3	4	5	6	7	8	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+3+8	1+6+8	1+7+8
Body 0mm	Back	0.257	0.242	0.294	0.257	0.217	0.259	0.299	0.314	0.258	0.220	0.272	0.319	0.241	0.475	0.454	0.390	0.432	0.599	0.579	0.602	0.794	0.773	0.709	0.751	0.918	0.898	0.921	1.375	1.520	1.500
	Left	0.238	0.329	0.010	0.343	0.422	0.013	0.141	0.012	0.017	0.044	0.329	0.099	0.043	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.822	0.822	0.822	0.822	0.822	0.822	0.822	1.222	1.222	1.222
	Right	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.119	0.052	0.121	0.207	0.233	0.249	0.152	0.519	0.452	0.521	0.607	0.633	0.649	0.552	0.604	0.785	0.801
	Top	0.069	0.105	0.089	0.063	0.096	0.075	0.128	0.116	0.106	0.092	0.120	0.116	0.083	0.012	0.007	0.014	0.019	0.019	0.026	0.015	0.140	0.135	0.142	0.147	0.147	0.154	0.143	0.150	0.162	0.169
	Bottom	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.800	0.800	0.800	0.800	0.800	0.800	0.800	1.200	1.200	1.200
Body 9mm	Back	0.475	1.067	0.211	0.553	1.133	0.234	0.376	0.381	0.290	0.287	0.633	0.187	0.559	0.040	0.037	0.028	0.097	0.090	0.105	0.051	1.173	1.170	1.161	1.230	1.223	1.238	1.184	1.221	1.274	1.289
	Top	0.174	0.383	0.068	0.183	0.471	0.054	0.257	0.061	0.050	0.057	0.225	0.130	0.233	0.012	0.007	0.014	0.019	0.019	0.026	0.015	0.483	0.478	0.485	0.490	0.490	0.497	0.486	0.493	0.505	0.512

17 Measurement Uncertainty

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.

18 Calibration Certificate

Please see the Appendix C

19 Test Setup Photos

Please see the Appendix D

Appendix A: System Check Plots

Appendix B: SAR Test Plots

Appendix C: Calibration certificate

Appendix D: Test Setup Photos

Appendix E: Conducted RF Output Power

--- The End ---