SGS

SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.

FCC SAR TEST REPORT

Application No.:	SUCR2412000552WM
Applicant:	Realme Chongqing Mobile Telecommunications Corp., Ltd.
Manufacturer:	Realme Chongqing Mobile Telecommunications Corp., Ltd.
Product Name:	Mobile Phone
Model No.(EUT):	RMX5070
Trade Mark:	realme
FCC ID:	2AUYFRMX5070
Standards:	FCC 47CFR §2.1093
Date of Receipt:	2024-12-05
Date of Test:	2024-12-06 to 2024-12-27
Date of Issue:	2025-01-14
Test conclusion:	**PASS ***

*　In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Leon Liu　　　　　　　　　　Nick Hu

Prepared by：Leon Xu/ Project Manager　　　　**Approved by：Nick HU/ Technical Manager**

Revision Record			
Version	**Description**	**Date**	**Remark**
01	Original	2025/01/14	

TEST SUMMARY

Frequency Band	Maximum Reported SAR(W/kg)			
	Head	Body-worn	Hotspot	Product specific 10g SAR
GSM850	0.67	0.20	0.14	/
GSM1900	**1.13**	0.23	0.18	/
WCDMA Band II	0.94	0.35	0.34	/
WCDMA Band IV	1.08	0.30	0.28	/
WCDMA Band V	0.52	0.24	0.15	/
LTE Band 2	0.89	0.31	0.28	/
LTE Band 7	0.92	0.36	0.28	/
LTE Band 12(17)	0.33	0.11	0.08	/
LTE Band 13	0.54	0.15	0.10	/
LTE Band 26(5)	0.70	0.16	0.14	/
LTE Band 38 PC3	0.97	0.36	**0.43**	/
LTE Band 41 PC3	1.08	0.35	0.36	/
LTE Band 66(4)	0.96	0.31	0.29	/
LTE Band 71	0.38	0.13	0.07	/
NR Band n2	1.02	0.27	0.28	/
NR Band n7	0.95	0.33	0.23	/
NR Band n26(n5)	0.64	0.18	0.10	/
NR Band n41 PC3(n38)	0.79	**0.37**	0.28	/
NR Band n66	1.04	0.28	0.26	/
NR Band n71	0.38	0.12	0.11	/
WI-FI (2.4GHz)	0.30	0.10	0.20	/
WI-FI (5GHz)	0.65	0.35	0.36	**1.20**
BT	0.23	0.04	0.06	/
SAR Limited(W/kg)	1.6			4.0
Maximum Simultaneous Transmission SAR (W/kg)				
Scenario	**Head**	**Body-worn**	**Hotspot**	**Product specific 10g SAR**
Sum SAR	1.45	0.75	0.82	/
SPLSR	/	/	/	/
SPLSR Limited	0.04			0.1

Note: The Simultaneous transmission SAR is the same test position of the WWAN Antenna + WiFi/BT Antenna.
According to TCB workshop October,2014 RF Exposure Procedures Update (Overlapping Bands): SAR for LTE Band 4 (Frequency range:1710 - 1755 MHz)/LTE Band 5 (Frequency range:824 - 849 MHz)/ LTE band 17 (frequency range: 704-716 MHz)/n5 (Frequency range:824 - 849 MHz)/ n38(Frequency range:2570 - 2620 MHz) is respectively covered by LTE Band66 (Frequency range:1710 - 1780 MHz)/LTE Band26 (Frequency range:814 - 849 MHz)/LTE band 12 (frequency range: 699-716 MHz)/n26 (Frequency range:814 - 849 MHz)/n41 (Frequency range:2496 - 2690 MHz)) due to similar frequency range, same maximum tune up limit and same channel bandwidth.
Because the frequency range is similar, the maximum tuning limit is the same, and the channel bandwidth and other operating parameters for the smaller band is fully supported by the larger band.

CONTENTS

1 General Information

1.1 Details of Client

Applicant:	Realme Chongqing Mobile Telecommunications Corp., Ltd.
Address:	No.178 Yulong Avenue, Yufengshan, Yubei District, Chongqing, China
Manufacturer:	Realme Chongqing Mobile Telecommunications Corp., Ltd.
Address:	No.178 Yulong Avenue, Yufengshan, Yubei District, Chongqing, China

1.2 Test Location

Company:	SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.
Address:	South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu) Pilot Free Trade Zone
Post code:	215000
Test Engineer:	Du Alger; Liu Leon-l

1.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **A2LA (Certificate No. 6336.01)**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6336.01.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0120.

IC#: 27594.

- **FCC –Designation Number: CN1312**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an accredited testing laboratory.

Designation Number: CN1312.

Test Firm Registration Number: 0031225543

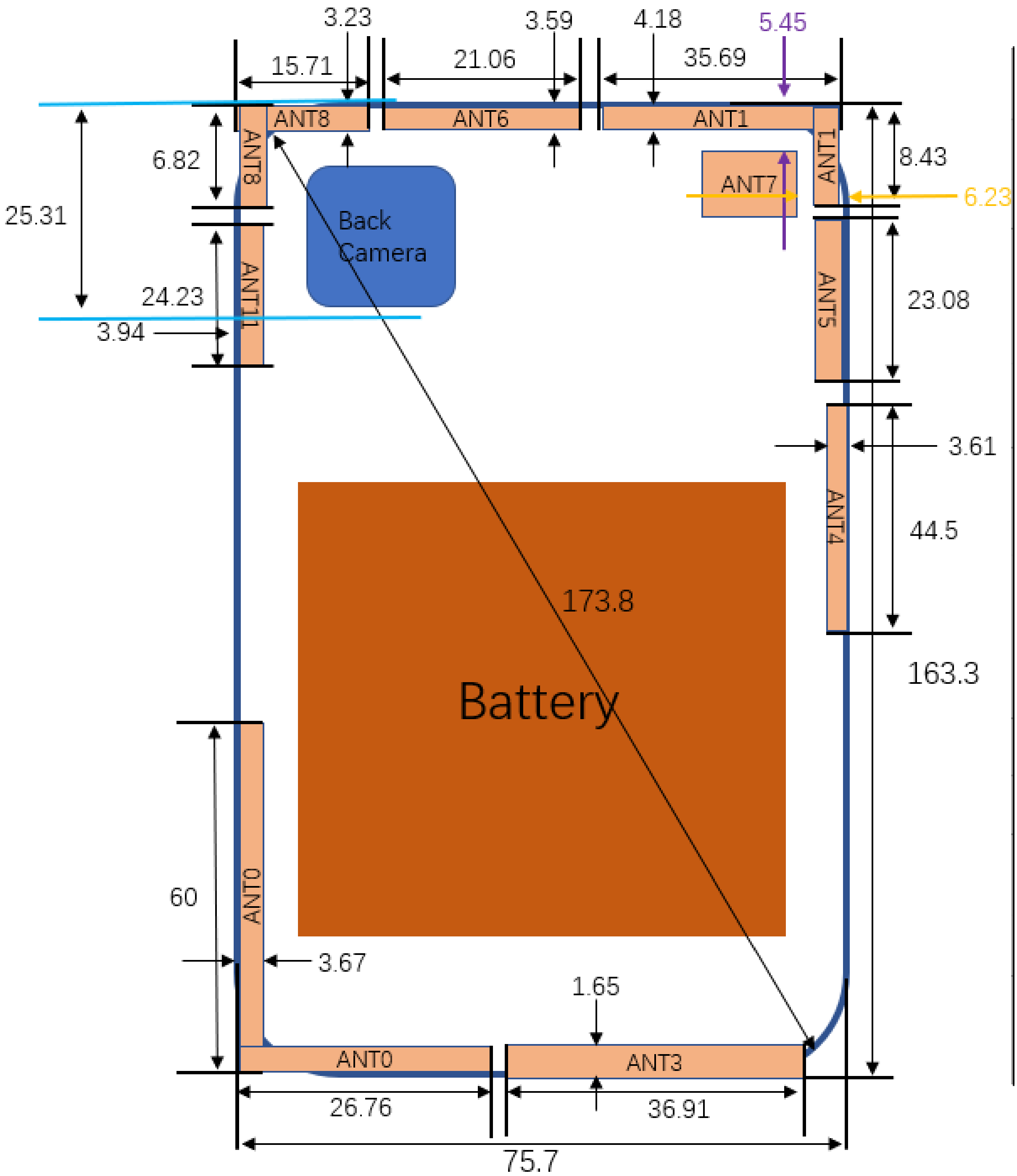
1.4 General Description of EUT

Device Type :	portable device		
Exposure Category:	uncontrolled environment / general population		
Product Name:	Mobile Phone		
Model No.(EUT):	RMX5070		
Trade Mark:	realme		
Product Phase:	Production Unit		
Hardware Version:	11		
Software Version:	realme UI 6.0		
IMEI:	863964070019933/863964070019925		
Device Operating Configurations :			
Modulation Mode:	**GSM:** GMSK, 8PSK; **WCDMA:** QPSK,16QAM; **LTE:** QPSK,16QAM,64QAM; **5G NR:** DFT-s-OFDM (QPSK, 16QAM, 64QAM, 256QAM), CP-OFDM (QPSK, 16QAM, 64QAM, 256QAM) **WIFI:** DSSS, OFDM, OFDMA; **BT:** GFSK, π/4DQPSK,8DPSK NFC: ASK		
Device Class:	B		
GPRS Multi-slots Class:	12	EGPRS Multi-slots Class:	12
HSDPA UE Category:	24	HSUPA UE Category	6
DC-HSDPA UE Category:	24		
Power Class	4,tested with power level 5(GSM850)		
	1,tested with power level 0(GSM1900)		
	3, tested with power control "all 1"(WCDMA Band)		
	3, tested with power control Max Power(LTE Band)		
Frequency Bands:	Band	Tx (MHz)	Rx (MHz)
	GSM850	824 - 849	869 - 894
	GSM1900	1850 - 1910	1930 - 1990
	WCDMA Band II	1850 - 1910	1930 - 1990
	WCDMA Band IV	1710 - 1755	2110 - 2155
	WCDMA Band V	824 - 849	869 - 894
	LTE Band 2	1850 - 1910	1930 - 1990
	LTE Band 4	1710 - 1755	2110 - 2155
	LTE Band 5	824 - 849	869 - 894
	LTE Band 7	2500 - 2570	2620 - 2690
	LTE Band 12	699 - 716	729 - 746
	LTE Band 13	777 - 787	746 - 756
	LTE Band 17	704 - 716	734 - 746
	LTE Band 26	814 - 849	859 - 894
	LTE Band 66	1710 - 1780	2110 - 2200
	LTE Band 71	663-698	617-652
	LTE Band 38	2570 - 2620	2570 - 2620
	LTE Band 41	2496 - 2690	2496 - 2690

	NR Band n2	1850 - 1910	1930 - 1990
	NR Band n5	824 - 849	869 - 894
	NR Band n7	2500 - 2570	2620 - 2690
	NR Band n26	814 - 849	859 - 894
	NR Band n66	1710 - 1780	2110 - 2200
	NR Band n38	2570 - 2620	2570 - 2620
	NR Band n41	2496 - 2690	2496 - 2690
	NR Band n71	663 – 698	617 – 652
	Bluetooth	2400 - 2483.5	2400 - 2483.5
	Wi-Fi 2.4G	2402 - 2462	2402 - 2462
	Wi-Fi 5G	5150 - 5250	5150 - 5250
		5250 - 5350	5250 - 5350
		5470 - 5725	5470 - 5725
		5725 - 5850	5725 - 5850
	NFC	13.56MHz	13.56MHz
RF Cable:	☒ Provided by the applicant ☐ Provided by the laboratory		
Battery Information:	Model:	BLPC07	
	Normal Voltage:	3.92V	
	Rated capacity:	5860mAh	
	Manufacturer:	Dongguan NVT Technology Co., Ltd	

Note: *Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information, SGS is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.
As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

1.4.1 DUT Antenna Locations (Back View)



Ant	Band:
Ant3	GSM: G1800/1900 WCDMA: B1/2/4 LTE: B1/2/3/4/7/38/40/41/66 5G NR: N1/2/3/7/38/40/41/66
Ant0	GSM: G850/900 WCDMA: B5/6/8/19 LTE: B5/8/12/13/17/18/19/20/26/28/71 5G NR: N5/8/26/28/71
Ant4	LTE: B1/3/4/66 5G NR: N1/3/66
Ant5	LTE: B7/38/40/41 5G NR: N7/38/40/41
Ant1	GSM: G850/900/1800/1900 WCDMA: B1/2/4/5/6/8/19 LTE: B1/2/3/4/5/7/8/12/13/17/18/19/20/26/28/38/40/41/66/71 5G NR: N1/2/3/5/7/8/20/26/28/38/40/41/66/71
Ant6	GPS L1
Ant8	WIFI2.4G: 11b/g/n WIFI5G: 11a/ac/ax
Ant11	LTE: B1/3/4/66/7/38/40/41 5G NR: N1/3/66/7/38/40/41

Note:

1) The test device is a smart phone. The overall diagonal dimension of this device is 173.8 mm. Per KDB 648474 D04, because the diagonal distance of this device is ≥160mm, so it is a phablet.

According to the distance between 5G NR/LTE/WCDMA/GSM&WIFI&BT antennas and the sides of the EUT we can draw the conclusion that:

EUT Sides for SAR Testing							
Mode	Exposure Condition	Front	Back	Left	Right	Top	Bottom
Ant 0	Hotspot/Product specific 10g SAR	Yes	Yes	No	Yes	No	Yes
Ant 1	Hotspot/Product specific 10g SAR	Yes	Yes	Yes	No	Yes	No
Ant 3	Hotspot/Product specific 10g SAR	Yes	Yes	Yes	Yes	No	Yes
Ant 4	Hotspot/Product specific 10g SAR	Yes	Yes	Yes	No	Yes	No
Ant 5	Hotspot/Product specific 10g SAR	Yes	Yes	Yes	No	Yes	No
Ant 6	Hotspot/Product specific 10g SAR	Yes	Yes	No	Yes	Yes	No
Ant 8	Hotspot/Product specific 10g SAR	Yes	Yes	Yes	Yes	Yes	No
Ant 11	Hotspot/Product specific 10g SAR	Yes	Yes	No	Yes	Yes	No

Note:

1) When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.

1.4.2 Time-averaged SAR feature for RF Exposure compliance

The equipment under test (EUT) is a portable handset, it contains the Qualcomm modem supporting 2G/3G/4G/5G NR/BT/WLAN/NFC bands, but only 2G/3G/4G/5G NR are enabled with Qualcomm Smart Transmit feature to control and manage transmitting power in real time and to always ensure the time-averaged RF exposure is in compliance with the FCC requirement.

The patameters obtained form SAR characterization (referred to as SAR char, respectively) will be used as input for TA-SAR.

<Terminologies in this report>

P_{limit}	The time-averaged RF power which corresponds to SAR_design_target
P_{max}	Maximum tune-up power level
SAR_design_target	The design target for SAR compliance. It should be less than SAR limit to account for all device design related uncertainties.
SAR char	Plimit for all the technologies/bands

<SAR Characterization>
SAR char must be generated to cover all radio configurations and usage scenarios that the wireless device supports for operating at 6 GHz or below. It will then be used as input for TA-SAR to control and manage RF exposure for f < 6 GHz.

SAR_design_target and Uncertainty
SAR_design_target is determined by ensuring that it is less than FCC SAR limit after accounting for total device designed related uncertainties specified by the manufacturer.
SAR_design_target < SARregulatory_limit x 10(-total uncertainty)/10

Uncertainty dB(k=2)	All Band
Total uncertainty	1.2

Exposure position	Frequency band	SAR Regulatory Limit W/kg(1g)	SAR design target W/kg(1g)
Head	WWAN	1.6	1.2
Body worn	WWAN	1.6	1.2
Hotspot	WWAN	1.6	1.2

Exposure position	Frequency band	SAR Regulatory Limit W/kg(10g)	SAR design target W/kg(10g)
Product specific 10gSAR	WWAN	4.0	3.0

The TA-SAR algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of SAR_design_target, below the predefined time-averaged power limit, for each characterized technology and band.
TA-SAR allows the device to transmit at higher power instantaneously, as high as Pmax, when needed, but enforces power limiting to maintain time-averaged transmit power to Plimit. Below table shows Plimit EFS settings and maximum tune up output power Pmax configured for this EUT for various transmit conditions (ECI: Exposure Condition Index).

P_{limt} for supported technologies and bands

Plimit_Head:

Band & Mode	Antenna	Test position	Measured conducted power, dBm	Tune up	Measured SAR, W/kg 1g avg	Plimit, dBm	Pmax, dBm	Report SAR	Full Power Tune Up Limit	Duty Cycle	Uncertainty	SAR_design _target:
GSM850 4TX	Ant 0	Right cheek	26.03	27.00	0.140	30.8	22.5	0.175	27.00	50	1.50	0.85
GSM850 4TX	Ant 1	Right cheek	25.42	26.50	0.520	24.5	22.0	0.667	26.50	50	1.50	0.85
GSM1900 4TX	Ant 1	Right tilted	20.87	22.50	0.778	18.2	20.0	1.132	24.50	50	1.50	0.85
GSM1900 4TX	Ant 3	Left cheek	24.54	25.50	0.067	32.6	21.0	0.084	25.50	50	1.50	0.85
WCDMA II	Ant 1	Right tilted	15.73	16.50	0.784	16.6	23.0	0.936	24.00	100	1.00	0.95
WCDMA II	Ant 3	Left cheek	24.07	25.00	0.152	32.0	24.0	0.188	25.00	100	1.00	0.95
WCDMA IV	Ant 1	Right tilted	21.44	22.50	0.850	21.9	23.0	1.085	24.00	100	1.00	0.95
WCDMA IV	Ant 3	Right cheek	24.28	25.00	0.156	32.1	24.0	0.184	25.00	100	1.00	0.95
WCDMA V	Ant 0	Right cheek	23.93	25.00	0.168	31.5	24.0	0.215	25.00	100	1.00	0.95
WCDMA V	Ant 1	Right cheek	22.37	23.50	0.401	26.1	22.5	0.520	23.50	100	1.00	0.95
LTE Band 2	Ant 1	Right tilted	17.24	18.00	0.746	18.3	22.5	0.889	23.50	100	1.00	0.95
LTE Band 2	Ant 3	Left cheek	23.61	24.50	0.131	32.2	22.5	0.161	23.50	100	1.00	0.95
LTE Band 2	Ant 4	Right cheek	21.54	22.70	0.674	23.0	22.5	0.880	23.50	100	1.00	0.95
LTE Band 66(4)	Ant 1	Right tilted	20.83	22.00	0.732	22.0	23.0	0.958	24.00	100	1.00	0.95
LTE Band 66(4)	Ant 3	Right cheek	23.15	24.00	0.156	31.0	23.0	0.190	24.00	100	1.00	0.95
LTE Band 66(4)	Ant 4	Right cheek	23.25	24.00	0.671	24.8	23.0	0.797	24.00	100	1.00	0.95
LTE Band 26(5)	Ant 0	Right cheek	22.87	24.00	0.128	31.6	23.0	0.166	24.00	100	1.00	0.95
LTE Band 26(5)	Ant 1	Right cheek	22.77	24.00	0.528	25.3	23.0	0.701	24.00	100	1.00	0.95
LTE Band 7	Ant 1	Right tilted	18.78	19.70	0.748	19.8	22.2	0.924	23.20	100	1.00	0.95
LTE Band 7	Ant 3	Left cheek	21.97	23.20	0.236	28.0	22.2	0.313	23.20	100	1.00	0.95
LTE Band 7	Ant 5	Right cheek	18.41	19.70	0.287	23.6	22.2	0.386	23.20	100	1.00	0.95
LTE Band 12(17)	Ant 0	Right cheek	22.89	24.00	0.057	35.1	23.0	0.074	24.00	100	1.00	0.95
LTE Band 12(17)	Ant 1	Right tilted	20.68	22.00	0.245	26.6	23.0	0.332	24.00	100	1.00	0.95
LTE Band 13	Ant 0	Right cheek	22.92	24.00	0.063	34.7	23.0	0.081	24.00	100	1.00	0.95
LTE Band 13	Ant 1	Right cheek	22.57	24.00	0.389	26.5	23.0	0.541	24.00	100	1.00	0.95
LTE Band 38 PC3	Ant 1	Right tilted	22.61	23.50	0.786	23.4	22.5	0.965	23.50	100	1.00	0.95
LTE Band 38 PC3	Ant 3	Left cheek	22.47	23.50	0.163	30.1	22.5	0.207	23.50	100	1.00	0.95
LTE Band 41 PC3	Ant 1	Right tilted	21.41	23.00	0.752	22.4	23.0	1.084	24.00	100	1.00	0.95
LTE Band 41 PC3	Ant 3	Right cheek	23.81	25.00	0.249	29.6	23.0	0.327	24.00	100	1.00	0.95
LTE Band 71	Ant 0	Right cheek	22.66	24.00	0.028	38.0	23.0	0.038	24.00	100	1.00	0.95
LTE Band 71	Ant 1	Right tilted	22.69	24.00	0.280	28.0	23.0	0.379	24.00	100	1.00	0.95

Band & Mode	Antenna	Test position	Measured conducted power, dBm	Tune up	Measured SAR, W/kg 1g avg	Plimit, dBm	Pmax, dBm	Report SAR	Full Power Tune Up Limit	Duty Cycle	Uncertainty	SAR_design _target:
FR1 n2	Ant 1	Right tilted	17.63	18.70	0.796	18.2	24.0	1.018	25.20	100	1.20	0.91
FR1 n2	Ant 3	Left cheek	23.97	25.20	0.137	32.2	24.0	0.182	25.20	100	1.20	0.91
FR1 n2	Ant 4	Right cheek	21.54	22.70	0.554	23.7	24.0	0.724	25.20	100	1.20	0.91
FR1 n26(5)	Ant 0	Right cheek	23.68	24.70	0.098	33.4	23.5	0.124	24.70	100	1.20	0.91
FR1 n26(5)	Ant 1	Right cheek	24.10	24.70	0.559	26.2	23.5	0.642	24.70	100	1.20	0.91
FR1 n7	Ant 1	Right tilted	18.23	19.20	0.758	19.0	23.0	0.948	24.20	100	1.20	0.91
FR1 n7	Ant 3	Left cheek	23.36	24.20	0.214	29.6	23.0	0.260	24.20	100	1.20	0.91
FR1 n41(38) PC3	Ant 1	Right tilted	19.79	20.70	0.643	21.3	24.0	0.793	25.20	100	1.20	0.91
FR1 n41(38) PC3	Ant 3	Left cheek	23.97	25.20	0.224	30.1	24.0	0.297	25.20	100	1.20	0.91
FR1 n66	Ant 1	Right tilted	22.07	23.20	0.800	22.6	24.0	1.038	25.20	100	1.20	0.91
FR1 n66	Ant 3	Left cheek	24.15	25.20	0.130	32.6	24.0	0.166	25.20	100	1.20	0.91
FR1 n66	Ant 4	Right cheek	22.39	23.20	0.497	25.0	24.0	0.599	25.20	100	1.20	0.91
FR1 n71	Ant 0	Right cheek	23.45	25.20	0.009	43.5	24.0	0.013	25.20	100	1.20	0.91
FR1 n71	Ant 1	Right cheek	23.87	25.20	0.281	29.0	24.0	0.382	25.20	100	1.20	0.91

Plimit_Body Wron:

Band & Mode	Antenna	Test position	Measured conducted power, dBm	Tune up	Measured SAR, W/kg 1g avg	Plimit, dBm	Pmax, dBm	Report SAR	Full Power Tune Up Limit	Duty Cycle	Uncertainty	SAR_design _target:
GSM850 4TX	Ant 0	Back side	26.03	27.00	0.156	30.4	22.5	0.195	27.00	50	1.50	0.85
GSM850 4TX	Ant 1	Back side	25.42	26.50	0.109	31.3	22.0	0.140	26.50	50	1.50	0.85
GSM1900 4TX	Ant 1	Back side	21.56	23.00	0.166	25.6	20.0	0.231	24.50	50	1.50	0.85
GSM1900 4TX	Ant 3	Back side	24.54	25.50	0.140	29.4	21.0	0.175	25.50	50	1.50	0.85
WCDMA II	Ant 1	Back side	19.13	19.80	0.262	24.7	23.0	0.306	24.00	100	1.00	0.95
WCDMA II	Ant 3	Back side	22.80	23.70	0.286	28.0	24.0	0.352	25.00	100	1.00	0.95
WCDMA IV	Ant 1	Back side	20.95	22.00	0.154	28.9	23.0	0.196	24.00	100	1.00	0.95
WCDMA IV	Ant 3	Back side	22.68	23.30	0.258	28.4	24.0	0.298	25.00	100	1.00	0.95
WCDMA V	Ant 0	Back side	23.93	25.00	0.191	30.9	24.0	0.244	25.00	100	1.00	0.95
WCDMA V	Ant 1	Back side	22.37	23.50	0.092	32.5	22.5	0.119	23.50	100	1.00	0.95
LTE Band 2	Ant 1	Back side	20.78	21.50	0.262	26.4	22.5	0.309	23.50	100	1.00	0.95
LTE Band 2	Ant 3	Back side	22.66	23.50	0.236	28.7	22.5	0.286	23.50	100	1.00	0.95
LTE Band 2	Ant 4	Back side	21.63	22.70	0.127	30.4	22.5	0.162	23.50	100	1.00	0.95
LTE Band 66(4)	Ant 1	Back side	21.87	23.30	0.177	29.2	23.0	0.246	24.00	100	1.00	0.95
LTE Band 66(4)	Ant 3	Back side	22.78	23.50	0.261	28.4	23.0	0.308	24.00	100	1.00	0.95
LTE Band 66(4)	Ant 4	Back side	21.35	23.10	0.128	30.1	23.0	0.192	24.00	100	1.00	0.95
LTE Band 26(5)	Ant 0	Back side	22.87	24.00	0.122	31.8	23.0	0.158	24.00	100	1.00	0.95
LTE Band 26(5)	Ant 1	Back side	22.77	24.00	0.097	32.7	23.0	0.129	24.00	100	1.00	0.95
LTE Band 7	Ant 1	Back side	21.21	22.20	0.123	30.1	22.2	0.154	23.20	100	1.00	0.95
LTE Band 7	Ant 3	Back side	21.45	22.50	0.286	26.7	22.2	0.364	23.20	100	1.00	0.95
LTE Band 7	Ant 5	Back side	20.87	22.20	0.122	29.8	22.2	0.166	23.20	100	1.00	0.95

Band & Mode	Antenna	Test position	Measured conducted power, dBm	Tune up	Measured SAR, W/kg 1g avg	Plimit, dBm	Pmax, dBm	Report SAR	Full Power Tune Up Limit	Duty Cycle	Uncertainty	SAR_design _target:
LTE Band 12(17)	Ant 0	Back side	22.89	24.00	0.088	33.2	23.0	0.114	24.00	100	1.00	0.95
LTE Band 12(17)	Ant 1	Back side	20.68	22.00	0.082	31.3	23.0	0.111	24.00	100	1.00	0.95
LTE Band 13	Ant 0	Back side	22.92	24.00	0.088	33.3	23.0	0.113	24.00	100	1.00	0.95
LTE Band 13	Ant 1	Back side	22.57	24.00	0.106	32.1	23.0	0.147	24.00	100	1.00	0.95
LTE Band 38 PC3	Ant 1	Back side	22.51	23.50	0.115	31.7	22.5	0.144	23.50	100	1.00	0.95
LTE Band 38 PC3	Ant 3	Back side	22.47	23.50	0.282	27.8	22.5	0.357	23.50	100	1.00	0.95
LTE Band 41 PC3	Ant 1	Back side	22.64	24.00	0.110	32.0	23.0	0.150	24.00	100	1.00	0.95
LTE Band 41 PC3	Ant 3	Back side	22.79	24.00	0.267	28.3	23.0	0.353	24.00	100	1.00	0.95
LTE Band 71	Ant 0	Back side	22.66	24.00	0.072	33.9	23.0	0.098	24.00	100	1.00	0.95
LTE Band 71	Ant 1	Back side	22.69	24.00	0.096	32.7	23.0	0.130	24.00	100	1.00	0.95
FR1 n2	Ant 1	Back side	19.45	20.50	0.204	25.9	24.0	0.260	25.20	100	1.20	0.91
FR1 n2	Ant 3	Back side	22.78	23.90	0.212	29.1	24.0	0.274	25.20	100	1.20	0.91
FR1 n2	Ant 4	Back side	21.42	22.50	0.118	30.3	24.0	0.151	25.20	100	1.20	0.91
FR1 n26(5)	Ant 0	Back side	23.59	24.70	0.139	31.8	23.5	0.179	24.70	100	1.20	0.91
FR1 n26(5)	Ant 1	Back side	24.10	24.70	0.096	33.9	23.5	0.110	24.70	100	1.20	0.91
FR1 n7	Ant 1	Back side	22.19	23.20	0.205	28.7	23.0	0.259	24.20	100	1.20	0.91
FR1 n7	Ant 3	Back side	21.40	22.20	0.272	26.6	23.0	0.327	24.20	100	1.20	0.91
FR1 n41(38) PC3	Ant 1	Back side	22.19	23.20	0.126	30.8	24.0	0.159	25.20	100	1.20	0.91
FR1 n41(38) PC3	Ant 3	Back side	22.11	23.20	0.286	27.1	24.0	0.368	25.20	100	1.20	0.91
FR1 n66	Ant 1	Back side	21.63	22.90	0.145	29.6	24.0	0.194	25.20	100	1.20	0.91
FR1 n66	Ant 3	Back side	22.56	23.70	0.216	28.8	24.0	0.281	25.20	100	1.20	0.91
FR1 n66	Ant 4	Back side	21.16	22.20	0.089	31.3	24.0	0.113	25.20	100	1.20	0.91
FR1 n71	Ant 0	Back side	23.45	25.20	0.058	35.4	24.0	0.087	25.20	100	1.20	0.91
FR1 n71	Ant 1	Back side	23.87	25.20	0.087	34.1	24.0	0.118	25.20	100	1.20	0.91

Plimit_Hotspot:

Band & Mode	Antenna	Test position	Measured conducted power, dBm	Tune up	Measured SAR, W/kg 1g avg	Plimit, dBm	Pmax, dBm	Report SAR	Full Power Tune Up Limit	Duty Cycle	Uncertainty	SAR_design _target:
GSM850 4TX	Ant 0	Back side	23.06	24.00	0.116	28.7	22.5	0.144	27.00	50	1.50	0.85
GSM850 4TX	Ant 1	Back side	22.54	23.50	0.095	29.0	22.0	0.119	26.50	50	1.50	0.85
GSM1900 4TX	Ant 1	Top side	16.58	17.50	0.144	21.3	20.0	0.178	24.50	50	1.50	0.85
GSM1900 4TX	Ant 3	Bottom side	19.58	20.50	0.130	24.7	21.0	0.161	25.50	50	1.50	0.85
WCDMA II	Ant 1	Top side	13.96	14.80	0.230	20.1	23.0	0.279	24.00	100	1.00	0.95
WCDMA II	Ant 3	Bottom side	17.82	18.70	0.279	23.2	24.0	0.342	25.00	100	1.00	0.95
WCDMA IV	Ant 1	Top side	15.93	17.00	0.126	24.7	23.0	0.161	24.00	100	1.00	0.95
WCDMA IV	Ant 3	Bottom side	17.71	18.30	0.242	23.7	24.0	0.277	25.00	100	1.00	0.95
WCDMA V	Ant 0	Back side	20.98	22.00	0.122	29.9	24.0	0.154	25.00	100	1.00	0.95
WCDMA V	Ant 1	Back side	19.46	20.50	0.084	30.0	22.5	0.107	23.50	100	1.00	0.95
LTE Band 2	Ant 1	Top side	15.96	16.50	0.251	21.8	22.5	0.284	23.50	100	1.00	0.95
LTE Band 2	Ant 3	Bottom side	18.71	19.50	0.228	24.9	22.5	0.273	23.50	100	1.00	0.95
LTE Band 2	Ant 4	Left side	16.57	17.70	0.130	25.2	22.5	0.169	23.50	100	1.00	0.95
LTE Band 66(4)	Ant 1	Top side	17.07	18.30	0.139	25.4	23.0	0.185	24.00	100	1.00	0.95
LTE Band 66(4)	Ant 3	Bottom side	17.66	18.50	0.242	23.6	23.0	0.294	24.00	100	1.00	0.95
LTE Band 66(4)	Ant 4	Left side	17.07	18.50	0.114	26.3	23.0	0.158	24.00	100	1.00	0.95
LTE Band 26(5)	Ant 0	Back side	20.80	22.00	0.088	31.1	23.0	0.116	24.00	100	1.00	0.95
LTE Band 26(5)	Ant 1	Top side	20.95	22.00	0.108	30.4	23.0	0.138	24.00	100	1.00	0.95
LTE Band 7	Ant 1	Top side	16.16	17.20	0.152	24.1	22.2	0.193	23.20	100	1.00	0.95
LTE Band 7	Ant 3	Bottom side	16.37	17.50	0.219	22.8	22.2	0.284	23.20	100	1.00	0.95
LTE Band 7	Ant 5	Left side	16.04	17.20	0.163	23.7	22.2	0.213	23.20	100	1.00	0.95
LTE Band 12(17)	Ant 0	Back side	20.93	22.00	0.066	32.5	23.0	0.084	24.00	100	1.00	0.95
LTE Band 12(17)	Ant 1	Back side	20.68	22.00	0.009	40.9	23.0	0.012	24.00	100	1.00	0.95
LTE Band 13	Ant 0	Back side	20.91	22.00	0.055	33.3	23.0	0.071	24.00	100	1.00	0.95
LTE Band 13	Ant 1	Top side	20.75	22.00	0.073	31.9	23.0	0.097	24.00	100	1.00	0.95
LTE Band 38 PC3	Ant 1	Top side	20.57	21.50	0.206	27.2	22.5	0.255	23.50	100	1.00	0.95
LTE Band 38 PC3	Ant 3	Bottom side	20.21	21.50	0.318	25.0	22.5	0.428	23.50	100	1.00	0.95
LTE Band 41 PC3	Ant 1	Top side	18.15	19.50	0.123	27.0	23.0	0.168	24.00	100	1.00	0.95
LTE Band 41 PC3	Ant 3	Bottom side	18.23	19.50	0.271	23.7	23.0	0.363	24.00	100	1.00	0.95
LTE Band 71	Ant 0	Back side	20.84	22.00	0.050	33.6	23.0	0.065	24.00	100	1.00	0.95
LTE Band 71	Ant 1	Top side	20.68	22.00	0.054	33.1	23.0	0.073	24.00	100	1.00	0.95
FR1 n2	Ant 1	Top side	14.55	15.50	0.197	21.2	24.0	0.245	25.20	100	1.20	0.91
FR1 n2	Ant 3	Bottom side	16.95	17.90	0.224	23.0	24.0	0.279	25.20	100	1.20	0.91
FR1 n2	Ant 4	Left side	16.53	17.50	0.140	24.7	24.0	0.175	25.20	100	1.20	0.91
FR1 n26(5)	Ant 0	Back side	20.60	21.70	0.074	31.5	23.5	0.095	24.70	100	1.20	0.91
FR1 n26(5)	Ant 1	Back side	20.89	21.70	0.081	31.4	23.5	0.098	24.70	100	1.20	0.91
FR1 n7	Ant 1	Top side	18.20	1.24	0.276	23.4	23.0	0.006	24.20	100	1.20	0.91
FR1 n7	Ant 3	Bottom side	16.25	17.20	0.188	23.1	23.0	0.234	24.20	100	1.20	0.91
FR1 n41(38) PC3	Ant 1	Top side	17.78	18.70	0.132	26.2	24.0	0.163	25.20	100	1.20	0.91

Band & Mode	Antenna	Test position	Measured conducted power, dBm	Tune up	Measured SAR, W/kg 1g avg	Plimit, dBm	Pmax, dBm	Report SAR	Full Power Tune Up Limit	Duty Cycle	Uncertainty	SAR_design _target:
FR1 n41(38) PC3	Ant 3	Bottom side	17.15	18.20	0.216	23.4	24.0	0.275	25.20	100	1.20	0.91
FR1 n66	Ant 1	Top side	16.76	17.90	0.132	25.1	24.0	0.172	25.20	100	1.20	0.91
FR1 n66	Ant 3	Bottom side	17.55	18.70	0.203	24.1	24.0	0.265	25.20	100	1.20	0.91
FR1 n66	Ant 4	Left side	16.32	17.20	0.090	26.4	24.0	0.110	25.20	100	1.20	0.91
FR1 n71	Ant 0	Back side	23.45	25.20	0.074	34.3	24.0	0.111	25.20	100	1.20	0.91
FR1 n71	Ant 1	Back side	23.88	25.20	0.072	34.9	24.0	0.098	25.20	100	1.20	0.91

Note:
1) *Pmax is used for RF tune up procedure. The maximum allowed output power is equal to Pmax + Total uncertainty.
2) The max allowed output power is the Plimit + Total uncertainty, and if Plimit is higher than Pmax, the device output power will be Pmax instead.
3) Note that WLAN operations are not enabled with TA-SAR.

The purpose of this report (Part 1 test) is to demonstrate that the EUT meets FCC SAR limits when transmitting in static transmission scenario at maximum allowable time-averaged power levels.

1.4.3 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) A fixed level power reduction is applied for some frequency bands when hotspot mode becomes active. When the hotspot is disabled, the power value will be recovered.
2) A fixed level power reduction is applied for some frequency bands when handset operate "held to the ear" condition, the power reduction triggered by audio receiver detection. The audio receiver detection is used to determine head or body scenario.

The detailed power reduction information can be referred to Appendix E.

1.5 Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radiofrequency Radiation Exposure Evaluation: Portable Devices
ANSI/IEEE C95.1-1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEC/IEEE 62209-1528:2020	Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)
KDB 941225 D01	3G SAR Measurement Procedures v03r01
KDB 941225 D05	SAR for LTE Devices v02r05
KDB 941225 D05A	LTE Rel.10 KDB Inquiry Sheet v01r02
KDB 941225 D06	Hotspot Mode SAR v02r01
KDB 248227 D01	SAR Guidance for IEEE 802 11 Wi-Fi SAR v02r02
KDB 648474 D04	Handset SAR v01r03
KDB 447498 D04	General RF Exposure Guidance v01
KDB 865664 D01	SAR Measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02	RF Exposure Reporting v01r02
KDB 690783 D01	SAR Listings on Grants v01r03
KDB 616217 D04	SAR for laptop and tablets v01r02

1.6 RF exposure limits

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR* (Brain*Trunk)	**1.60 mW/g**	8.00 mW/g
Spatial Average SAR** (Whole Body)	0.08 mW/g	0.40 mW/g
Spatial Peak SAR*** (Hands/Feet/Ankle/Wrist)	**4.00 mW/g**	20.00 mW/g

Notes:
* 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
** The Spatial Average value of the SAR averaged over the whole body.
*** The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.
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.)

2 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

Table 1： The Ambient Conditions

3 SAR Measurements System Configuration

3.1 The SAR Measurement System

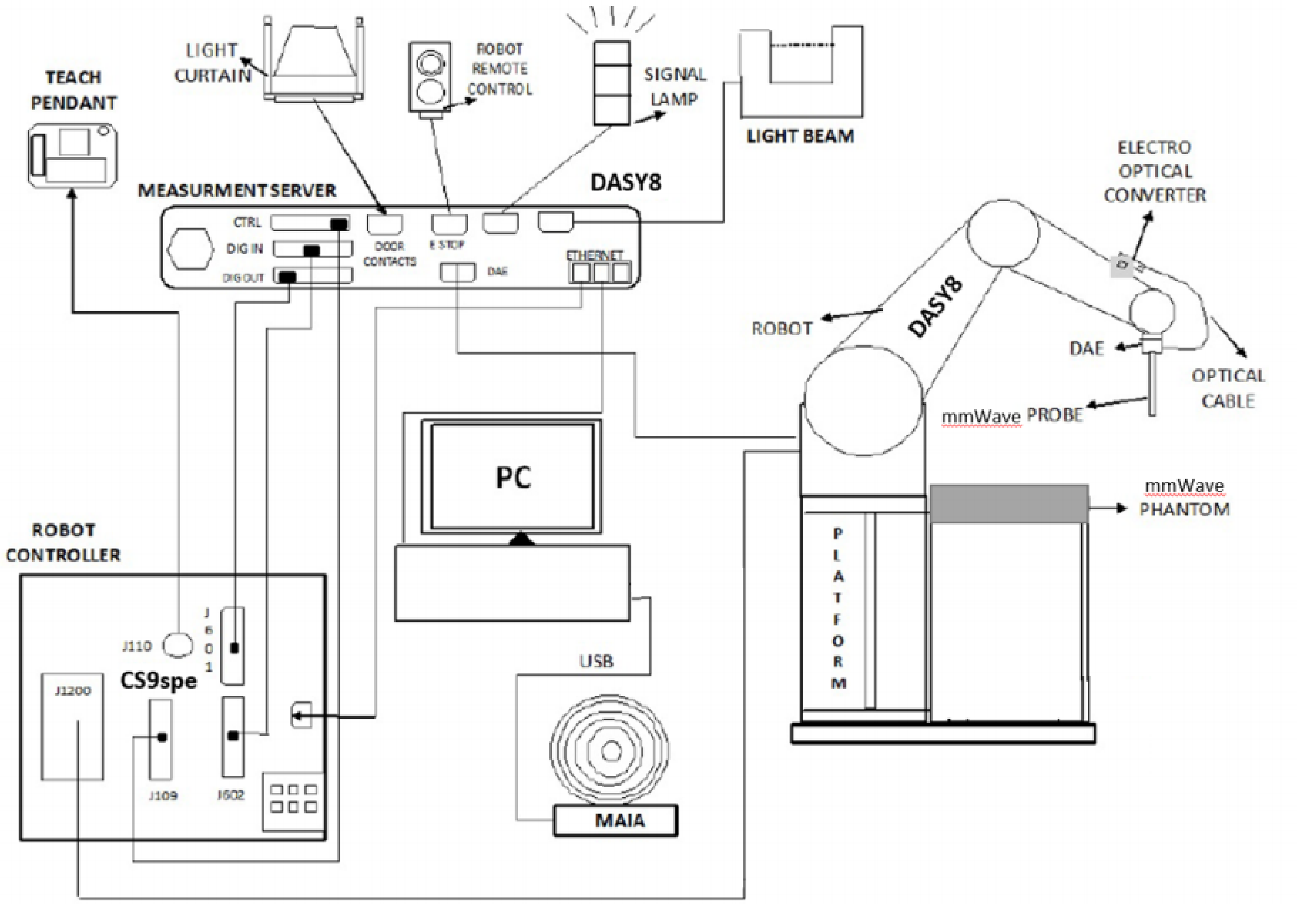
This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY professional system). A E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ (|Ei|2)/ ρ where σ and ρ are the conductivity and mass density of the tissue-Simulate.

The DASY system for performing compliance tests consists of the following items:
A standard high precision 6-axis robot (Stabile RX family) with controller, teach pendant and software. An arm extension for accommodation the data acquisition electronics (DAE).

A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

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 between optical and electrical of the signals for the digital communication to DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.



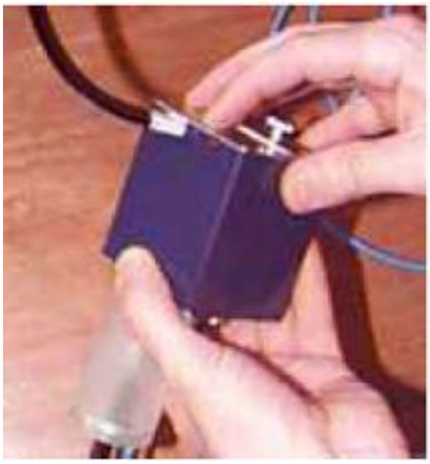
F-1. SAR Measurement System Configuration

- 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.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand, right-hand and Body Worn usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validating the proper functioning of the system.

3.2 Isotropic E-field Probe EX3DV4

	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
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

3.3 Data Acquisition Electronics (DAE)

Model	DAE	
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.	
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV,400mV)	
Input Offset Voltage	< 5μV (with auto zero)	
Input Bias Current	< 50 f A	
Dimensions	60 x 60 x 68 mm	

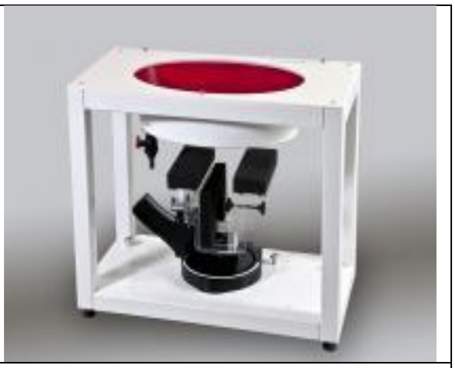
3.4 SAM Twin Phantom

Material	Vinylester, glass fiber reinforced (VE-GF)	
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)	
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 shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Twin SAM V5.0 has the same shell geometry and is manufactured from the same material as Twin SAM V4.0, but has reinforced top structure.

3.5 ELI Phantom

Material	Vinylester, glass fiber reinforced (VE-GF)	
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	
Filling Volume	approx. 30 liters	
Wooden Support	SPEAG standard phantom table	
Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles. ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure.		

3.6 Device Holder for Transmitters

F-2. **Device Holder for Transmitters**

- The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centres for both scales are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.
- The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

3.7 Measurement procedure

3.7.1 Scanning procedure

Step 1: Power reference measurement

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure.

Step 2: Area scan

The SAR distribution at the exposed side of the head was measured at a distance of 4mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm*15mm or 12mm*12mm or 10mm*10mm.Based on the area scan data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Zoom scan

Around this point, a volume of 32mm*32mm*30mm (f≤2GHz), 30mm*30mm*30mm (f for 2-3GHz) and 24mm*24mm*22mm (f for 5-6GHz) was assessed by measuring 5x5x7 points (f≤2GHz), 7x7x7 points (f for 2-3GHz) and 7x7x12 points (f for 5-6GHz). On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

The data at the surface was extrapolated, since the centre of the dipoles is 2.0mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. (This can be variable. Refer to the probe specification).The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The volume was integrated with the trapezoidal algorithm. One thousand points were interpolated to calculate the average. All neighbouring volumes were evaluated until no neighboring volume with a higher average value was found.

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std. 1528-2013.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	$\frac{1}{2}\cdot\delta\cdot\ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5\cdot\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Step 4: Power reference measurement (drift)

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 indicated drift is mainly the variation of the DUT's output power and should vary max. ± 5 %

3.7.2 Data Storage

The DASY software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DAE4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated. The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [m W/g], [m W/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

3.7.3 Data Evaluation by SEMCAD

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

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

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

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

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

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

With Vi = compensated signal of channel i (i = x, y, z)
Ui = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp i = diode compression point (DASY parameter)

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

E-field probes:

$$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

H-field probes:

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

With Vi = compensated signal of channel i (i = x, y, z)
Normi = sensor sensitivity of channel I (i = x, y, z)
[mV/(V/m)2] for E-field Probes
ConvF = sensitivity enhancement in solution
aij = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strength of channel i in V/m
Hi = magnetic field strength of channel i in A/m

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

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

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

$$SAR = (Etot^2 \cdot \sigma) / (\varepsilon \cdot 1000)$$

with SAR = local specific absorption rate in mW/g
Etot = total field strength in V/m
σ= conductivity in [mho/m] or [Siemens/m]
ε= equivalent tissue density in g/cm3

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

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

with Ppwe = equivalent power density of a plane wave in mW/cm2
Etot = total electric field strength in V/m
Htot = total magnetic field strength in A/m

4 SAR measurement variability and uncertainty

4.1 SAR measurement variability

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04, 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. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.
1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, 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 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

4.2 SAR measurement uncertainty

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

IEC- 62209-1528 sets out the general test methods to be followed when carrying out an RF exposure compliance assessment of wireless devices implementing device-based time-averaging methods for the management and/or mitigation of specific absorption rate (SAR) in the 4 MHz to 6 GHz frequency band. It does not cover requirements that are based on power density above 6 GHz or requirements to protect against nerve stimulation for the frequency range from 3 kHz to 10MHz.

Measurements and results are all in compliance with the standards listed. All measurements and results are recorded and maintained at the laboratory performing the tests and measurement uncertainties are taken into account when comparing measurements to pass/ fail criteria. The Expanded uncertainty (95% CONFIDENCE INTERVAL) is **23.34%**.

a	b	c	d	e = f(d,k)	g	i = C*g/e	K
Uncertainty Component	Section in P1528	Tol (%)	Prob.Dist.	Div.	Ci (1g)	1g ui (%)	Vi(Veff)
Measurement system							
Probe calibration	7.2.2.1	7.4	N	1	1	7.40	∞
Axial isotropy	7.2.2.2	1.2	R	$\sqrt{3}$	1	0.69	∞

hemispherical isotropy	7.2.2.2	3.2	R	$\sqrt{3}$	1	1.85	∞
Linearity	7.2.2.3	0.9	R	$\sqrt{3}$	1	0.52	∞
Probe modulation response	7.2.2.4	0	R	$\sqrt{3}$	1	0.00	∞
Detection limits	7.2.2.5	0.25	R	$\sqrt{3}$	1	0.14	∞
Boundary effect	7.2.2.6	1.0	R	$\sqrt{3}$	1	0.58	∞
Readout electronics	7.2.2.7	0.3	N	1	1	0.30	∞
Response time	7.2.2.8	0	R	$\sqrt{3}$	1	0.00	∞
Integration time	7.2.2.9	2.6	R	$\sqrt{3}$	1	1.50	∞
RF ambient conditions – noise	7.2.4.5	3	R	$\sqrt{3}$	1	1.73	∞
RF ambient conditions – reflections	7.2.4.5	3	R	$\sqrt{3}$	1	1.73	∞
Probe positioner mech. restrictions	7.2.3.1	1.5	R	$\sqrt{3}$	1	0.87	∞
Probe positioning with respect to phantom shell	7.2.3.3	2.9	R	$\sqrt{3}$	1	1.67	∞
Post-processing	7.2.5	1	R	$\sqrt{3}$	1	0.58	∞
Test sample related							
Device holder uncertainty	7.2.3.4.2	3.6	N	1	1	3.60	∞
Test sample positioning	7.2.3.4.3	3.7	N	1	1	3.70	9
Power scaling	L.3	5.0	R	$\sqrt{3}$	1	2.89	∞
Drift of output power (measured SAR drift)	7.2.2.10	5	R	$\sqrt{3}$	1	2.89	∞
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	7.2.3.2	4	R	$\sqrt{3}$	1	2.31	∞
Algorithm for correcting SAR for deviations in permittivity and conductivity	7.2.4.3	1.9	N	1	1	1.90	∞
Liquid conductivity (meas.)	7.2.4.3	5.78	N	1	0.78	4.51	4
Liquid permittivity (meas.)	7.2.4.3	0.62	N	1	0.23	0.14	5
Liquid permittivity –temperature uncertainty	7.2.4.4	0.2	R	$\sqrt{3}$	0.78	0.09	∞
Liquid conductivity –temperature uncertainty	7.2.4.4	5.37	R	$\sqrt{3}$	0.23	0.71	∞
Combined standard uncertainty	**RSS**					11.67	417
Expanded uncertainty (95% CONFIDENCE INTERVAL)		**K=2**				**23.34**	

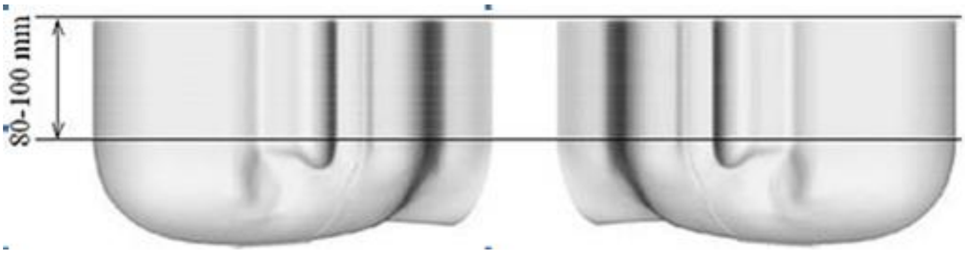
5 Description of Test Position

5.1 Head Exposure Condition

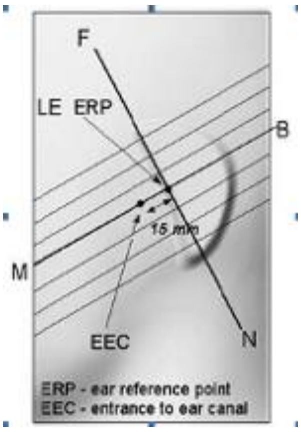
5.1.1 SAM Phantom Shape

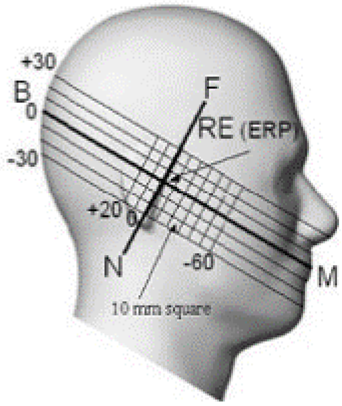
F-3. Front, back, and side views of SAM (model for the phantom shell). Full-head model is for illustration purposes only-procedures in this recommended practice are intended primarily for the phantom setup.

Note: The centre strip including the nose region has a different thickness tolerance.



F-4. Sagittally bisected phantom with extended perimeter (shown placed on its side as used for SAR measurements)

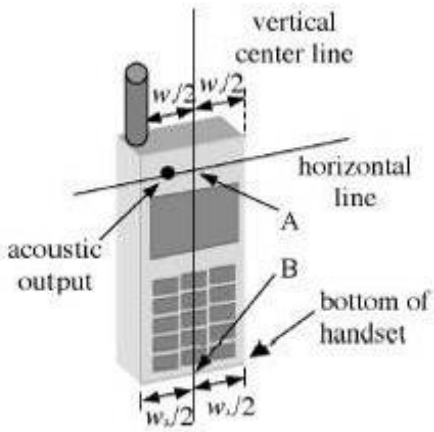




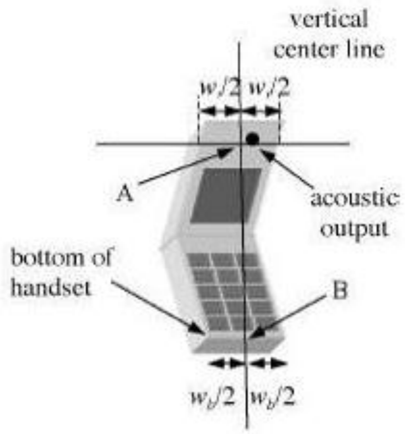
F-5. Close-up side view of phantom, showing the ear region, N-F and B-M lines, and seven cross-sectional plane locations

F-6. Side view of the phantom showing relevant markings and seven cross-sectional plane locations

5.1.2 EUT constructions



F-7. Handset vertical and horizontal reference lines-“fixed case”



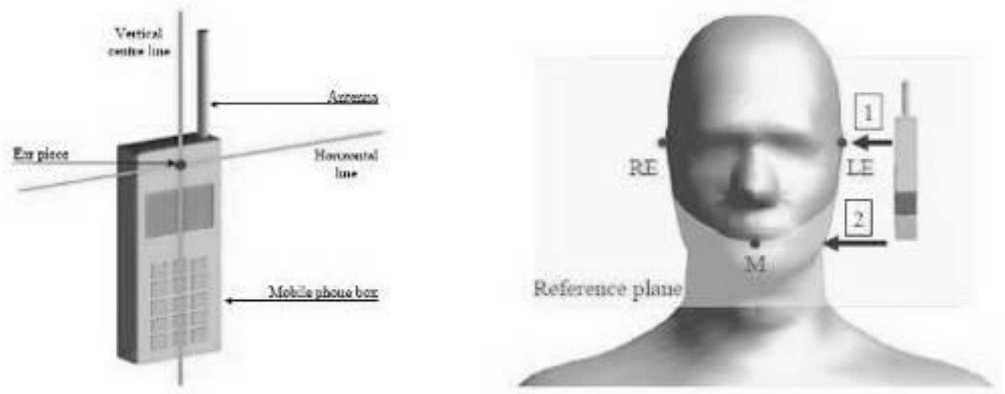
F-8. Handset vertical and horizontal reference lines-“clam-shell case”

5.1.3 Definition of the “cheek” position

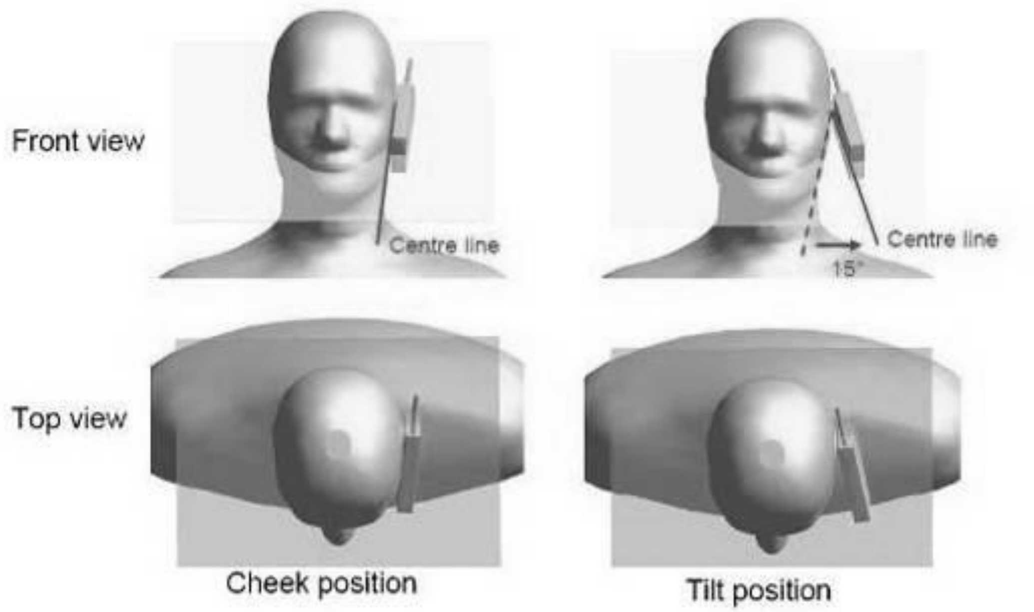
a) Position the device with the vertical centre line of the body of the device and the horizontal line crossing the centre of the ear piece in a plane parallel to the sagittal plane of the phantom ("initial position"). While maintaining the device in this plane, align the vertical centre line with the reference plane containing the three ear and mouth reference points (M, RE and LE) and align the centre of the ear piece with the line RE-LE.
b) Translate the mobile phone box towards the phantom with the ear piece aligned with the line LE-RE until telephone touches the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the box until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.

5.1.4 Definition of the “tilted” position

a) Position the device in the “cheek” position described above;
b) While maintaining the device in the reference plane described above and pivoting against the ear, move it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost.



F-9. **Definition of the reference lines and points, on the phone and on the phantom and initial position**



F-10. **“Cheek” and “tilt” positions of the mobile phone on the left side**

5.2 Body Exposure Condition

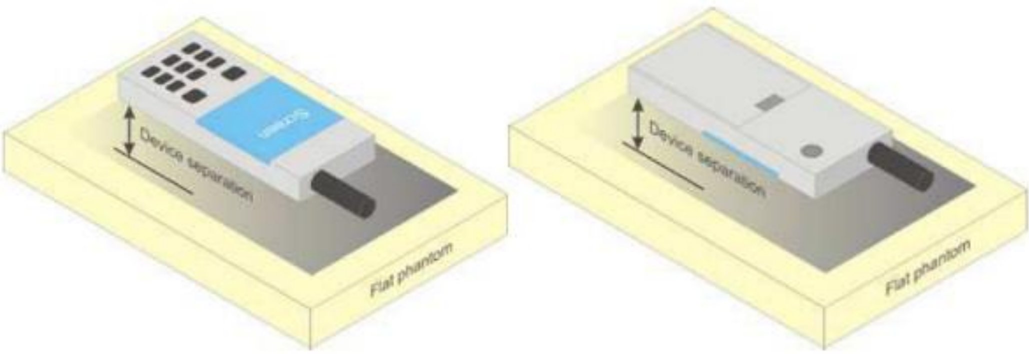
5.2.1 Body-worn accessory exposure conditions

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations.

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. Per FCC KDB Publication 648474 D04, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.



F-11. **Test positions for body-worn devices.**

5.2.2 Wireless Router exposure conditions

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. For devices with form factors smaller than 9 cm x 5 cm, a test separation distance of 5 mm is required.

5.3 Extremity exposure conditions

Per FCC KDB 648474 D04, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the device is marketed as “Phablet”.
The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for Product Specific 10-g SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, Product Specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg; however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.
Due to the SAR result, only the following frequency bands need to test with 0mm for the Product Specific 10-g SAR, the others are not required.

6 SAR System Verification Procedure

6.1 Tissue Simulate Liquid

6.1.1 Recipes for Tissue Simulate Liquid

The bellowing tables give the recipes for tissue simulating liquids to be used in different frequency bands：

Ingredients (% by weight)	Frequency (MHz)				
	450	700-900	1750-2000	2300-2500	2500-2700
Water	38.56	40.30	55.24	55.00	54.92
Salt (NaCl)	3.95	1.38	0.31	0.2	0.23
Sucrose	56.32	57.90	0	0	0
HEC	0.98	0.24	0	0	0
Bactericide	0.19	0.18	0	0	0
Tween	0	0	44.45	44.80	44.85
Salt: 99⁺% Pure Sodium Chloride; Sucrose: 98⁺% Pure Sucrose; Water: De-ionized, 16 MΩ⁺ resistivity; HEC: Hydroxyethyl Cellulose; Tween: Polyoxyethylene (20) sorbitan monolaurate					
HSL13MHz is composed of the following ingredients： Water：50-90% Non-ionic detergents：5-50% Nacl：0-2% Preservative：0.03-0.1% HSL5GHz is composed of the following ingredients： Water：50-65% Mineral oil：10-30% Emulsifiers：8-25% Sodium salt：0-1.5%					

Table 2： Recipe of Tissue Simulate Liquid

6.1.2 Measurement for Tissue Simulate Liquid

The Conductivity (σ) and Permittivity (ρ) are listed in bellow table. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was 22±2°C.

Head:

Measurement for Tissue Simulate Liquid							
Tissue Type	Measured Frequency （MHz）	Target Tissue (±5%)		Measured Tissue		Liquid Temp.	Test Date
		ε_r	σ(S/m)	ε_r	σ(S/m)	(℃)	
750 Head	750	41.9 (39.81~44)	0.89 (0.85~0.94)	41.600	0.892	22.8	2024/12/6
835 Head	835	41.5 (39.43~43.58)	0.90 (0.86~0.95)	42.200	0.908	22.4	2024/12/7
1750 Head	1750	40.1 (38.10~42.11)	1.37 (1.30~1.44)	38.600	1.360	22.6	2024/12/8
1950 Head	1900	40.0 (38.00~42.00)	1.40 (1.33~1.47)	39.100	1.400	22.7	2024/12/9
2450 Head	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	38.800	1.820	22.8	2024/12/10
2600 Head	2600	39.0 (37.05~40.95)	1.96 (1.86~2.06)	38.600	1.990	22.5	2024/12/11
5250 Head	5250	35.9 (34.11~37.70)	4.66 (4.47~4.95)	35.800	4.720	22.9	2024/12/14
5600 Head	5600	35.5 (33.73~37.30)	5.07 (4.82~5.32)	35.100	5.100	22.6	2024/12/15
5750 Head	5750	35.4 (33.63~37.17)	5.22 (4.96~5.48)	34.700	5.280	22.5	2024/12/16

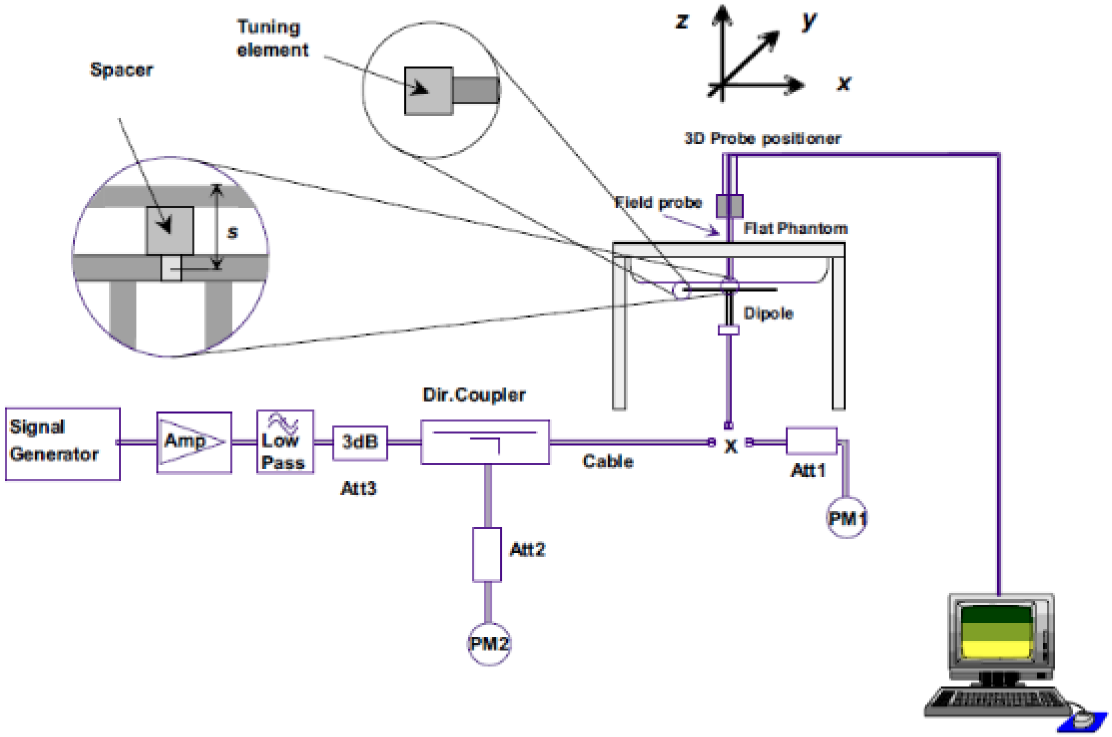
Body & Hotspot:

Measurement for Tissue Simulate Liquid							
Tissue Type	Measured Frequency （MHz）	Target Tissue (±5%)		Measured Tissue		Liquid Temp.	Test Date
		ε_r	σ(S/m)	ε_r	σ(S/m)	(℃)	
13 Head	13	55.0	0.75	55.300	0.762	22.3	2024/12/16
750 Head	750	41.9 (39.81~44)	0.89 (0.85~0.94)	41.700	0.882	22.7	2024/12/17
835 Head	835	41.5 (39.43~43.58)	0.90 (0.86~0.95)	42.000	0.904	23.0	2024/12/18
1750 Head	1750	40.1 (38.10~42.11)	1.37 (1.30~1.44)	38.600	1.340	22.6	2024/12/19
1950 Head	1900	40.0 (38.00~42.00)	1.40 (1.33~1.47)	39.100	1.390	22.8	2024/12/20
2450 Head	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	38.700	1.800	23.1	2024/12/21
2600 Head	2600	39.0 (37.05~40.95)	1.96 (1.86~2.06)	38.400	1.980	23.2	2024/12/22
5250 Head	5250	35.9 (34.11~37.70)	4.66 (4.47~4.95)	35.600	4.680	23.3	2024/12/25
5600 Head	5600	35.5 (33.73~37.30)	5.07 (4.82~5.32)	35.000	5.060	23.1	2024/12/26
5750 Head	5750	35.4 (33.63~37.17)	5.22 (4.96~5.48)	34.600	5.230	22.9	2024/12/27

Table 3： Measurement result of Tissue electric parameters.

6.2 SAR System Check

The microwave circuit arrangement for system Check is sketched in F-12. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the following table (A power level of 250mW (below 3GHz) or 100mW (3-6GHz) was input to the dipole antenna). During the tests, the ambient temperature of the laboratory was in the range 22±2°C, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15±0.5 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



F-12. the microwave circuit arrangement used for SAR system check

F-13.

6.2.1 Justification for Extended SAR Dipole Calibrations

1) Referring to KDB865664 D01 requirements for dipole calibration, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.
a) There is no physical damage on the dipole;
b) System check with specific dipole is within 10% of calibrated value;
c) Return-loss is within 10% of calibrated measurement;
d) Impedance is within 5Ω from the previous measurement.

2) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

6.2.2 Summary System Check Result(s)

Head:

SAR System Validation Result(s)											
Validation Kit		Measured SAR 250mW	Measured SAR 250mW	Measured SAR (normalized to 1W)	Measured SAR (normalized to 1W)	Target SAR (normalized to 1W)	Target SAR (normalized to 1W)	Deviation (Within ±10%)		Liquid Temp. (℃)	Test Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1-g(W/kg)	10-g(W/kg)	1-g(W/kg)	10-g(W/kg)		
D750V3	Head	2.15	1.36	8.60	5.44	8.40	5.52	2.38%	-1.45%	22.8	2024/12/6
D835V2	Head	2.41	1.53	9.64	6.12	9.60	6.16	0.42%	-0.65%	22.4	2024/12/7
D1750V2	Head	9.48	5.03	37.92	20.12	36.30	19.30	4.46%	4.25%	22.6	2024/12/8
D1950V2	Head	10.30	5.33	41.20	21.32	40.40	20.80	1.98%	2.50%	22.7	2024/12/9
D2450V2	Head	12.30	5.67	49.20	22.68	52.70	24.60	-6.64%	-7.80%	22.8	2024/12/10
D2600V2	Head	13.70	6.16	54.80	24.64	57.30	25.40	-4.36%	-2.99%	22.5	2024/12/11
Validation Kit		Measured SAR 100mW	Measured SAR 100mW	Measured SAR (normalized to 1W)	Measured SAR (normalized to 1W)	Target SAR (normalized to 1W)	Target SAR (normalized to 1W)	Deviation (Within ±10%)		Liquid Temp. (℃)	Test Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1-g(W/kg)	10-g(W/kg)	1-g(W/kg)	10-g(W/kg)		
D5GHzV2	Head (5.25GHz)	7.68	2.11	76.80	21.10	77.20	21.90	-0.52%	-3.65%	22.9	2024/12/14
	Head (5.6GHz)	7.84	2.22	78.40	22.20	81.10	22.80	-3.33%	-2.63%	22.6	2024/12/15
	Head (5.75GHz)	8.01	2.19	80.10	21.90	77.80	21.70	2.96%	0.92%	22.5	2024/12/16

Body & Hotspot:

SAR System Validation Result(s)											
Validation Kit		Measured SAR 250mW	Measured SAR 250mW	Measured SAR (normalized to 1W)	Measured SAR (normalized to 1W)	Target SAR (normalized to 1W)	Target SAR (normalized to 1W)	Deviation (Within ±10%)		Liquid Temp. (℃)	Test Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1-g(W/kg)	10-g(W/kg)	1-g(W/kg)	10-g(W/kg)		
CLA-13	Head	0.114	0.072	0.46	0.29	0.421	0.266	8.31%	8.27%	22.4	2024/12/16
D750V3	Head	2.28	1.4	9.12	5.60	8.40	5.52	8.57%	1.45%	22.7	2024/12/17
D835V2	Head	2.51	1.59	10.04	6.36	9.60	6.16	4.58%	3.25%	23.0	2024/12/18
D1750V2	Head	9.48	5.02	37.92	20.08	36.30	19.30	4.46%	4.04%	22.6	2024/12/19
D1950V2	Head	10.40	5.30	41.60	21.20	40.40	20.80	2.97%	1.92%	22.8	2024/12/20
D2450V2	Head	12.10	5.71	48.40	22.84	52.70	24.60	-8.16%	-7.15%	23.1	2024/12/21
D2600V2	Head	13.80	6.16	55.20	24.64	57.30	25.40	-3.66%	-2.99%	23.2	2024/12/22
Validation Kit		Measured SAR 100mW	Measured SAR 100mW	Measured SAR (normalized to 1W)	Measured SAR (normalized to 1W)	Target SAR (normalized to 1W)	Target SAR (normalized to 1W)	Deviation (Within ±10%)		Liquid Temp. (℃)	Test Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1-g(W/kg)	10-g(W/kg)	1-g(W/kg)	10-g(W/kg)		
D5GHzV2	Head (5.25GHz)	7.80	2.15	78.00	21.50	77.20	21.90	1.04%	-1.83%	23.3	2024/12/25
	Head (5.6GHz)	7.95	2.27	79.50	22.70	81.10	22.80	-1.97%	-0.44%	23.1	2024/12/26
	Head (5.75GHz)	8.09	2.26	80.90	22.60	77.80	21.70	3.98%	4.15%	22.9	2024/12/27

Table 4： SAR System Check Result.

6.2.3 Detailed System Check Results

Please see the Appendix A

7 Test Configuration

7.1 3G SAR Test Reduction Procedure

According to KDB 941225D01, in the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode. This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as “otherwise” in the applicable procedures; SAR measurement is required for the secondary mode.

7.2 Operation Configurations

7.2.1 GSM Test Configuration

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a base station by air link. Using CMW500 the power lever is set to “5”and “0” in SAR of GSM 850 and GSM 1900. The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink, and at most 4 timeslots in downlink, the maximum total timeslot is 5.

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8-PSK.

The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode

7.2.2 WCDMA Test Configuration

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.

2）. Head SAR

SAR for next to the ear head exposure 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 AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure

3）. Body SAR

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 DPDCHn 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 spreaing code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the handset, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

4）. HSDPA / HSUPA / DC-HSDPA

According to KDB 941225 D01v03, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA

a) HSDPA

HSDPA is configured according to the applicable UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms and a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors(βc, βd), and HS-DPCCH power offset parameters (ΔACK, ΔNACK, ΔCQI) are set according to values indicated in the following table The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Sub-test	βc	Bd	βd(SF)	βc/βd	βhs	CM(dB)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0	0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note1: △ACK, △NACK and △CQI= 8 Ahs = βhs/βc=30/15 βhs=30/15*βc
Note2:For the HS-DPCCH power mask requirement test in clause 5.2C,5.7A,and the Error Vector Magnitude(EVM) with HS-DPCCH test in clause 5.13.1.A,and HSDPA EVM with phase discontinuity in clause 5.13.1AA, △ACK and △NACK= 8 (Ahs=30/15) with βhs=30/15*βc,and △CQI=
7 (Ahs=24/15) with βhs=24/15*βc.
Note3: CM=1 forβc/βd =12/15, βhs/βc=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

The measurements were performed with a Fixed Reference Channel (FRC) and H-Set 1 QPSK.

Parameter	Value
Nominal average inf. bit rate	534 kbit/s
Inter-TTI Distance	3 TTI‟s
Number of HARQ Processes	2 Processes
Information Bit Payload	3202 Bits
MAC-d PDU size	336 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	4800 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	9600 SMLs
Coding Rate	0.67
Number of Physical Channel Codes	5

Table 5: settings of required H-Set 1 QPSK acc. to 3GPP 34.121

HS-DSCH Category	Maximum HS-DSCH Codes Received	Minimum Inter-TTI Interval	MaximumH S-DSCH Transport BlockBits/HS-DSCH TTI	Total Soft Channel Bits
1	5	3	7298	19200
2	5	3	7298	28800
3	5	2	7298	28800
4	5	2	7298	38400
5	5	1	7298	57600
6	5	1	7298	67200
7	10	1	14411	115200
8	10	1	14411	134400
9	15	1	25251	172800
10	15	1	27952	172800
11	5	2	3630	14400
12	5	1	3630	28800
13	15	1	34800	259200
14	15	1	42196	259200
15	15	1	23370	345600
16	15	1	27952	345600

Table 6： HSDPA UE category

b) <u>HSUPA</u>

Due to inner loop power control requirements in HSUPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSUPA should be configured according to the values indicated below as well as other applicable procedures described in the „WCDMA Handset" and „Release 5 HSUPA Data Device" sections of 3G device.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ec} (SF)	β_{ed} (code)	CM (2) (dB)	MPR (dB)	AG (4) Index	E-TFCI
1	11/15 (3)	15/15 (3)	64	11/15 (3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 β_{ed2}:47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (4)	15/15 (4)	64	15/15 (4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ ACK, Δ NACK and Δ CQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$

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

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

Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$

Note 5 : Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g

Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Table 7: Subtests for UMTS Release 6 HSUPA

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI(ms)	Minimum Speading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	10	2SF2&2SF4	11484	5.76
	4	4	2		20000	2.00
7 (No DPDCH)	4	8	2	2SF2&2SF4	22996	?
	4	4	10		20000	?

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4.UE categories 1 to 6 support QPSK only. UE category 7 supports QPSK and 16QAM.(TS25.306-7.3.0).

Table 8: HSUPA UE category

c) 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 Second serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.
The following tests were completed according to procedures in section 7.3.13 of 3GPP TS 34.108 v9.5.0. A summary of these settings are illustrated below:
Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH _Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13.
The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.
The measurements were performed with a Fixed Reference Channel (FRC) H-Set 12 with QPSK.

Parameter	Value
Nominal average inf. bit rate	60 kbit/s
Inter-TTI Distance	1 TTI's
Number of HARQ Processes	6 Processes
Information Bit Payload	120 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	960 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	3200 SMLs
Coding Rate	0.15
Number of Physical Channel Codes	1

Table 9： settings of required H-Set 12 QPSK acc. to 3GPP 34.121

Note:
1. The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table above.
2. Maximum number of transmission is limited to 1,i.e.,retransmission is not allowed. The redundancy and constellation version 0 shall be used.

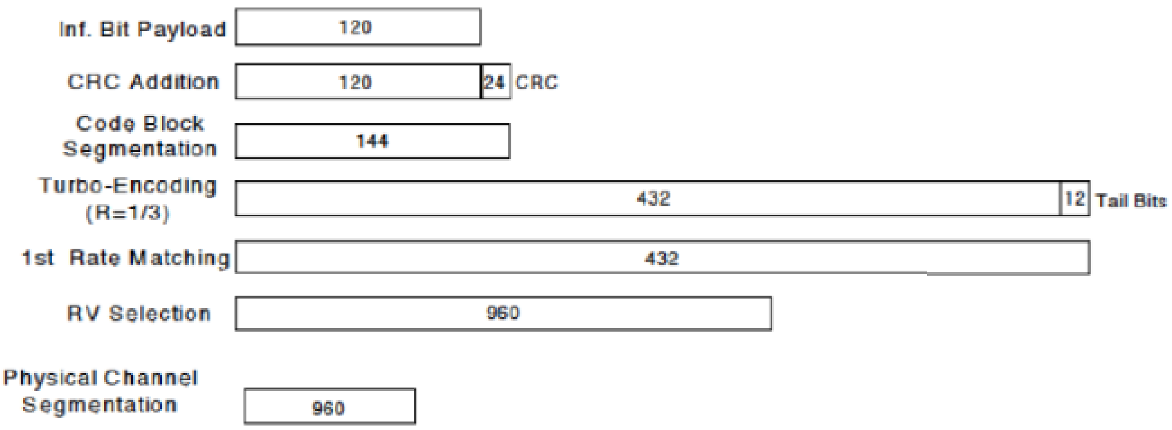


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 5 procedures. A summary of subtest settings are illustrated below:

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM(dB)(2)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0	0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5
Note 1: ΔACK, ΔNACK and ΔCQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$ Note 2: CM=1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases. Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$							

Up commands are set continuously to set the UE to Max power.

Note:

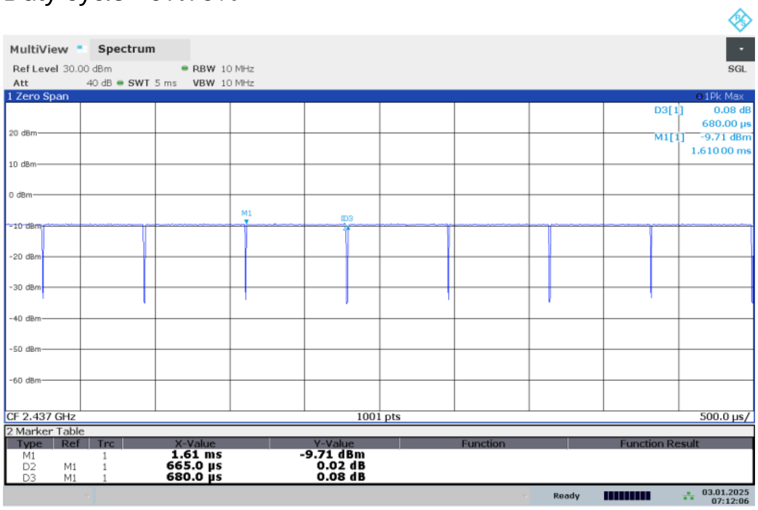
1. The Dual Carriers transmission only applies to HSDPA physical channels
2. The Dual Carriers belong to the same Node and are on adjacent carriers.
3. The Dual Carriers do not support MIMO to serve UEs configured for dual cell operation
4. The Dual Carriers operate in the same frequency band.
5. The device doesn't support the modulation of 16QAM in uplink but 64QAM in downlink for DC-HSDPA mode.
6. The device doesn't support carrier aggregation for it just can operate in Release 8.

7.2.3 WiFi Test Configuration

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.

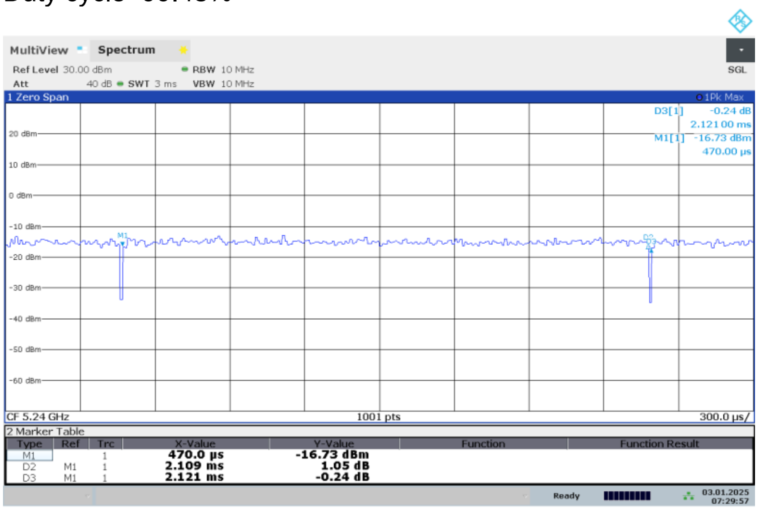
7.2.4 Duty cycle

Wi-Fi 2.4GHz 802.11b:
Duty cycle= 97.79%



07:12:07 03.01.2025

Wi-Fi 5GHz 802.11a:
Duty cycle=99.43%



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7.2.4.1 Initial Test Position SAR Test Reduction 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.

7.2.4.2 Initial Test Configuration Procedures

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.

7.2.4.3 Subsequent Test Configuration Procedures

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. The initial test position procedure is applied to next to the ear, UMPC mini-tablet and hotspot mode configurations. When the same maximum output power is specified for multiple transmission modes, additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. The subsequent test configuration and SAR measurement procedures are described in the following.

1）. When SAR test exclusion provisions of KDB Publication 447498 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power transmission mode subsequent test configuration(s) in that frequency band or aggregated band and exposure configuration.

2）. When the highest *reported* SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, 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 is not required for that subsequent test configuration.

3）. The number of channels in the initial test configuration and subsequent test configuration can be different due to differences in channel bandwidth. When SAR measurement is required for a subsequent test configuration and the channel bandwidth is smaller than that in the initial test configuration, all channels in the subsequent test configuration that overlap with the larger bandwidth channel tested in the initial test configuration should be used to determine the highest maximum output power channel. This step requires additional power measurement to identify the highest maximum output power channel in the subsequent test configuration to determine SAR test reduction.

   a) SAR should first be measured for the channel with highest measured output power in the subsequent test configuration.

   b) SAR for subsequent highest measured maximum output power channels in the subsequent test configuration is required only when the *reported* SAR of the preceding higher maximum output power channel(s) in the subsequent test configuration is > 1.2 W/kg or until all required channels are tested. i) For channels with the same measured maximum output power, SAR should be measured using the channel closest to the center frequency of the larger channel bandwidth channel in the initial test configuration.

4）. SAR measurements for the remaining highest specified maximum output power OFDM transmission mode configurations that have not been tested in the initial test configuration (highest maximum output) or subsequent test configuration(s) (subsequent next highest maximum output power) is determined by recursively applying the subsequent test configuration procedures in this section to the remaining configurations according to the following:

   a) replace “subsequent test configuration” with “next subsequent test configuration” (i.e., subsequent next highest specified maximum output power configuration)

   b) replace “initial test configuration” with “all tested higher output power configurations”

7.2.4.4 2.4 GHz WiFi 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. When SAR measurement is required for an OFDM configuration, the initial test configuration, subsequent test configuration and initial test position procedures are applied. The SAR test exclusion requirements for 802.11g/n OFDM configurations are described in following.

- **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 in 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.

- **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, including sub-sections). 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.

- **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.

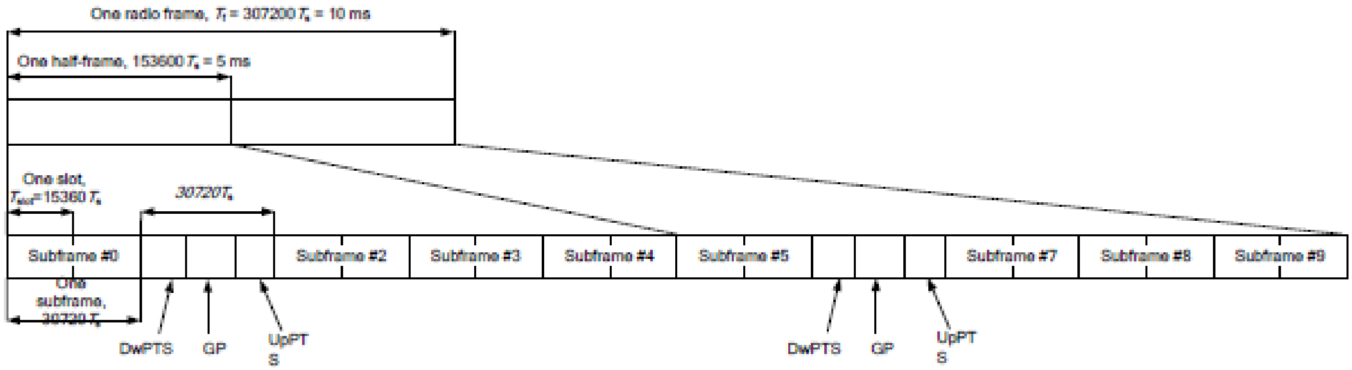
7.2.5 LTE Test Configuration

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The Anritsu MT8820C was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

TDD LTE test consideration

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:



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

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

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

A) 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.

B) 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 (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3

C) A-MPR

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

D) Largest channel bandwidth standalone SAR test requirements

1) 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.

2) QPSK with 50% RB allocation

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

3) 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 1) and 2) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

4) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections 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.

E) 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 section A) to determine the channels and RB configurations that need SAR testing and 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.

F) LTE CA additional specification

The device supports intra-band contiguous and inter-band discontinuous uplink and downlink LTE Carrier Aggregation (CA). When carrier aggregation applies, implementation and measurement details for the following are necessary.

a) Intra-band carrier aggregation requirements for uplink.

b) Intra-band and inter-band carrier aggregation requirements for downlink.

The possible downlink and uplink LTE CA combinations supported by this device are as below tables per 3GPP TS 36.101 V15.4.0. The conducted power measurement results of downlink and uplink LTE CA are provided in Appendix E (Conducted RF Output Power). The downlink LTE CA SAR test is not required since the maximum output power for downlink LTE CA was not more than 0.25dB higher than the maximum output power for without downlink LTE CA.

2CC Downlink Carrier Aggregation	2CC Downlink Carrier Aggregation	3CC Downlink Carrier Aggregation	3CC Downlink Carrier Aggregation	4CC Downlink Carrier Aggregation
CA_12A-66A	CA_38A-66A	CA_26A-41C	CA_4A-4A-5A	CA_5A-7A-66A-66A
CA_26A-38A	CA_38C	CA_2A-5A-66A	CA_4A-4A-7A	CA_5A-7C-66A
CA_2A-12A	CA_5A-38A	CA_2A-5A-7A	CA_4A-7C	CA_7C-66A-66A
CA_2A-2A	CA_5A-41A	CA_2A-7A-7A	CA_5A-66C	-
CA_2A-38A	CA_66C	CA_2A-7C	CA_5A-7A-7A	-
CA_2A-4A	CA_7A-26A	CA_41A-41A-41A	CA_7A-66A-66A	-
CA_2C	CA_7B	CA_41D	-	-

SAR test procedure for intra-band contiguous UL LTE CA is as below:

1)Maximum output power is measured for each UL CA configuration for the required test channels described in KDB 941225 D05

－UL PCC configuration is determined by the required test channel

－SCC and subsequent CCs are added alternatively to either side of the PCC or within the transmission band for channels at the ends of a frequency band.

2)SAR for UL CA is required in each exposure condition and frequency band combination

3)For this device , as the maximum output for Intra-band uplink LTE CA is ≤ standalone LTE mode (without CA),

- PCC is configured according to the highest standalone SAR configuration tested.

- SCC and subsequent CCs are configured according to procedures used for power measurement and parameters (BW, RB etc.) similar to that used for the PCC

4)When the reported SAR for UL CA configuration, described above, is > 1.2 W/kg, UL CA SAR is also required for all required test channels (PCC based)

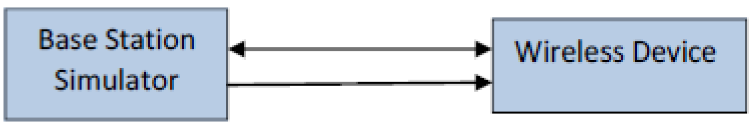
5)UL CA SAR is also required for standalone SAR configurations > 1.2 W/kg when they are scaled to the UL CA power level.

Intra-band contiguous CA operating bands:

E-UTRA CA Band	E-UTRA Band	Uplink (UL) operating band BS receive / UE transmit $F_{UL\_low} - F_{UL\_high}$			Downlink (DL) operating band BS transmit / UE receive $F_{DL\_low} - F_{DL\_high}$			Duplex Mode
CA_7C	7	2500 MHz	–	2570 MHz	2620 MHz	–	2690 MHz	FDD
CA_38C	38	2570 MHz	–	2620 MHz	2570 MHz	–	2620 MHz	TDD
CA_66C	66	1710 MHz	–	1780 MHz	2110 MHz	–	2180 MHz	FDD
CA_41C	41	2496 MHz	–	2690 MHz	2496 MHz	–	2690 MHz	TDD

6)General PCC and SCC configuration selection procedure
- PCC uplink channel, channel bandwidth, modulation and RB configurations were selected based on section C)3)b)ii) of KDB 941225 D05 V01r02. All LTE bandwidth conducted powers needed for PCC uplink configuration selection can be found in appendix E. The downlink PCC channel was paired with the selected PCC uplink channel according to normal configurations without carrier aggregation.

- To maximize aggregated bandwidth, highest channel bandwidth available for that CA combination was selected for SCC. For inter-band CA, the SCC downlink channels were selected near the middle of their transmission bands. For contiguous intra-band CA, the downlink channel spacing between the component carriers was set to multiple of 300 kHz less than the nominal channel spacing defined in section 5.4.1A of 3GPP TS 36.521. For non-contiguous intra-band CA, the downlink channel spacing between the component carriers was set to be larger than the nominal channel spacing and provided maximum separation between the component carriers.
All selected PCC and SCC(s) remained fully within the uplink/downlink transmission band of the respective component carrier.



DL CA Power Measurement Setup

c) Inter-band carrier aggregation requirements for uplink.

1. For Inter-band uplink CA mode, Qualcomm TA SAR in WWAN directly adds the time-averaged RF exposure from 4G(LTE) and time-averaged RF exposure from another 4G(LTE). TA-SAR algorithm controls the total RF exposure of Inter-band uplink CA to not exceed FCC limit.

The Inter band Uplink CA as below table:

Band/Antenna		LTE Band 4			LTE Band 5		LTE Band 7			LTE Band 26		LTE Band 66		
		Ant3	Ant1	Ant4	Ant0	Ant1	Ant3	Ant1	Ant5	Ant0	Ant1	Ant3	Ant1	Ant4
LTE Band 2	Ant3													
	Ant1													
	Ant4	√					√					√		
LTE Band 4	Ant3				√				√					
	Ant1													
	Ant4													
LTE Band 5	Ant0						√					√		
	Ant1													
LTE Band 7	Ant3									√				
	Ant1													
	Ant5													

7.2.6 NR Band Test Configuration

2. NR Band n5/7/38/41/66 support SA mode and NR Band n5/7/38/41/66 support NSA mode. LTE+NR Band operations are possible only with LTE under EN-DC mode and the operations are possible as following table:

Band/ Antenna		LTE Band 2			LTE Band 4			LTE Band 5		LTE Band 7			LTE Band 12		LTE Band 26	
		Ant3	Ant1	Ant4	Ant3	Ant1	Ant4	Ant0	Ant1	Ant3	Ant1	Ant5	Ant0	Ant1	Ant0	Ant1
n5	Ant0										√					
	Ant1															
n7	Ant3			√			√									
	Ant1							√								
	Ant5															
n38	Ant3			√			√									
	Ant1			√			√	√								
	Ant5															
n41	Ant3			√			√								√	
	Ant1			√			√									
	Ant5															
n66	Ant3			√				√				√				
	Ant1												√			
	Ant4												√			

Band/ Antenna		LTE Band 66			LTE Band 71		LTE Band 38			LTE Band 40			LTE Band 41		
		Ant3	Ant1	Ant4	Ant0	Ant1	Ant3	Ant1	Ant5	Ant3	Ant1	Ant5	Ant3	Ant1	Ant5
n5	Ant0		√	√											
	Ant1														
n7	Ant3			√											
	Ant1														
	Ant5														
n38	Ant3			√											
	Ant1			√											
	Ant5														
n41	Ant3			√											
	Ant1			√											
	Ant5														
n66	Ant3														
	Ant1				√										
	Ant4				√										

3. The general information supported by the NR band is as following table:

Band			N2	n5	n7	n26	n66	n38-PC3	n41-PC3	n71
Modulation	DFT-s-OFDM	QPSK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		16QAM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		64QAM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		256QAM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	CP-OFDM	QPSK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		16QAM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		64QAM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		256QAM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Duty Cycle			100%	100%	100%	100%	100%	100%	100%	100%

Band	SCS	Bandwidth														
		5Mhz	10Mhz	15Mhz	20Mhz	25Mhz	30Mhz	35Mhz	40Mhz	45Mhz	50Mhz	60Mhz	70Mhz	80Mhz	90Mhz	100Mhz
N2	15KHZ	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N5	15KHZ	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N7	15KHZ	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A
N26	15KHZ	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N66	15KHZ	Yes	Yes	Yes	Yes	N/A	Yes	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N71	15KHZ	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N38	30KHZ	N/A	N/A	N/A	Yes	N/A	Yes	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N41	30KHZ	N/A	N/A	N/A	Yes	N/A	Yes	N/A	Yes	N/A	Yes	Yes	Yes	Yes	Yes	Yes

4. For 5G NR test procedure was following step similar FCC KDB 941225 D05:
   a. For DFT-OFDM and CP-OFDM output power measurement reduction, according to 3GPP 38.101 maximum power reduction for power class 3, the CP-OFDM mode will not higher than DFT-OFDM mode, therefore, similar FCC KDB 941225 D05 procedure for other modulation output power for each RB allocation configuration is > not ½ dB higher than the same configuration in DFT-QPSK and the reported SAR for the DFT-QPSK configuration is ≤ 1.45 W/kg; CP-OFDM testing is not required.
   b. For DFT-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class 3, for PI/2 BPSK/16QAM/64QMA/256QAM and smaller bandwidth output power will spot check largest channel bandwidth worst RB configuration to ensure the PI/2 BPSK/16QAM/64QMA/256QAM and smaller bandwidth output power will not ½ dB higher than the same configuration in the largest supported bandwidth.
   c. SAR testing start with the largest SCS and 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.
   d. 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
   e. QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
   f. PI/2 BPSK/16QAM/64QAM/256QAM output powers according to 3GPP MPR will not ½ dB higher than the same configuration in QPSK, also reported SAR for the QPSK configuration is less than 1.45 W/kg, PI/2 BPSK/16QAM/64QAM/256QAM SAR testing are not required.
   g. Smaller SCS/bandwidth output power for each RB allocation configuration for this device will not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg, smaller bandwidth SAR testing is not required for this device

5. 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 TS 38.101-1 Section 6.2.2 under Table 6.2.2 -1.

Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	PI/2 BPSK	≤ 3.5[1]	≤ 1.2[1]	≤ 0.2[1]
		≤ 0.5[2]	≤ 0.5[2]	0[2]
	QPSK	≤ 1		0
	16 QAM	≤ 2		≤ 1
	64 QAM	≤ 2.5		
	256 QAM	≤ 4.5		
CP-OFDM	QPSK	≤ 3		≤ 1.5
	16 QAM	≤ 3		≤ 2
	64 QAM	≤ 3.5		
	256 QAM	≤ 6.5		

NOTE 1: Applicable for UE operating in TDD mode with Pi/2 BPSK modulation and UE indicates support for UE capability powerBoosting-pi2BPSK and if the IE powerBoostPi2BPSK is set to 1 and 40 % or less slots in radio frame are used for UL transmission for bands n41,n78. The reference power of 0 dB MPR is 26dBm.
NOTE 2: Applicable for UE operating in FDD mode, or in TDD mode in bands other than n41,n78 with Pi/2 BPSK modulation and if the IE powerBoostPi2BPSK is set to 0 and if more than 40 % of slots in radio frame are used for UL transmission for bands n41,n78.

6. For FDD NR Band operation does not have the fixed UL/DL frame structure, but during the transmitting/ receiving it can be operated in the slot structure of 100% UL duty cycle, we are proposing the conservative way to evaluate SAR at 100% duty cycle. For the purpose of test NR Band standalone SAR, and also test SAR level at 100% TX duty cycle.
7. For 5G NR Sub6GHz SISO Mode, SAR Test plan as below:
    1) For 5G NR NSA mode with the same UL EN_DC combination but different DL EN_DC combinations, eg: EN-DC configuration: UL DC_7A_n5 (UL two bands) with DL DC_7C_n5 (DL two bands)
    a) The UL EN-DC configuration, including the Tx antenna configuration, RF path, the channel bandwidth and other operating parameters are the same.
    b) The maximum output power, including tolerance, for the UL EN-DC configuration with DL two or more bands must be ≤ the same UL EN-DC configuration with DL two bands only to qualify for the SAR test exclusion.
8. For EN-DC SAR, as the existing SAR test system cannot test the multiple different frequency bands simultaneous Transmission SAR at the same time, we suggest that the conservative “max + max” multi-Tx and SAR scaling method can be used to evaluate the inter-band Uplink EN-DC SAR from standalone SAR test results of each LTE and NR EN-DC component band and the conservative “max + max” multi-Tx method to combine the scaled SAR value from each EN-DC component band as the inter-band Uplink EN-DC SAR. All Simultaneous Transmission Scenarios will be evaluated independently in the final SAR report.
9. When the reported SAR for and EN DC configuration is greater than 1.2 W/kg, EN DC SAR is also required for other NR based test channels.
10. EN DC SAR is also required for standalone NR configurations greater than 1.2 W/kg when scaled to the EN DC power level.

8 Test Result

8.1 Measurement of RF Conducted Power

The detailed conducted power table can refer to Appendix E.

Note:

1）. For GSM SAR the time based average power is relevant. The difference in between depends on the duty cycle of the TDMA signal:

No. of timeslots	1	2	3	4
Duty Cycle	1:8.3	1:4.15	1:2.77	1:2.075
Time based avg. power compared to slotted avg. power	-9.19	-6.18	-4.42	-3.17

2）. The frame-averaged power is linearly proportion to the slot number configured and it is linearly scaled the maximum burst-averaged power based on time slots. The calculated method is shown as below:
Frame-averaged power = 10 x log (Burst-averaged power mW x Slot used / 8

3）. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used

4）. According to FCC guidance, the output power with uplink CA active was measured for the high / middle / low channel configuration with the highest reported SAR for each exposure condition, the power was measured with wideband signal integration over both component carriers.

5）. In applying the power measurement procedures of KDB 941225 D05A for DL CA to qualify for UL SAR test exclusion, power measurement is required only for the subset in each row with the largest combination of frequency bands and CCs.

6）. Maximum output power measurement is required for each UL CA configuration for the required test channels described in KDB 941225 D05.

7）. Conducted power measurement results of downlink LTE carrier aggregation are provided to quantify downlink only carrier aggregation SAR test exclusion per KDB 941225 D05A.Uplink maximum output power is measured with downlink carrier aggregation active, using the channel with highest measured maximum output power when downlink carrier aggregation is inactive, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive, therefore SAR evaluation with downlink carrier aggregation can be excluded.

The possible downlink LTE CA combinations supported by this device are as below tables per 3GPP TS 36.101 V15.4.0. The detailed conducted power measurement results of downlink LTE CA are provided in the SAR report per 3GPP TS 36.521-1 V14.4.0. According to KDB 941225 D05A, the downlink only carrier aggregation conditions for this device can be excluded from SAR testing.

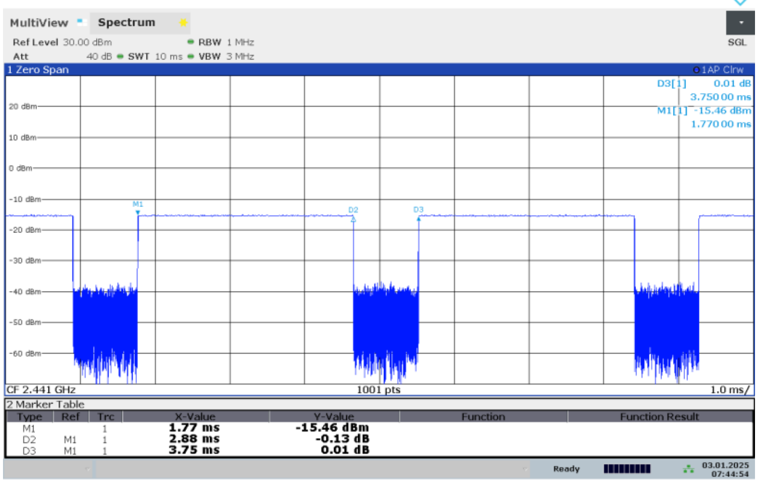
The conducted power measurement results of downlink LTE CA Conducted Power are as Appendix E conducted RF output power, so the downlink only carrier aggregation conditions for this device can be excluded from SAR testing.

8）. For conducted power of WIFI must be measured at each transmit antenna port according to the DSSS and OFDM transmission configurations in each standalone and aggregated frequency band. For each transmission mode configuration, power must be measured for the highest and lowest channels; and at the mid-band channel(s) when there are at least 3 channels. For configurations with multiple mid-band channels, due to an even number of channels, both channels should be measured. Power measurement is required for the transmission mode configuration with the highest maximum output power specified for production units.

1) When the same highest maximum output power specification applies to multiple transmission modes, the largest channel bandwidth configuration with the lowest order modulation and lowest data rate is measured.

2) When the same highest maximum output power is specified for multiple largest channel bandwidth configurations with the same lowest order modulation or lowest order modulation and lowest data rate, power measurement is required for all equivalent 802.11 configurations with the same maximum output power.

9）. The conducted power of BT is measured with RMS detector.
BT DH5 Duty Cycle=76.80%



Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	1.77 ms	-15.46 dBm		
D2	M1	1	2.88 ms	-0.13 dB		
D3	M1	1	3.75 ms	0.01 dB		

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8.2 Measurement of SAR Data

Note:

1) The maximum reported SAR value is marked in **bold.** Graph results refer to Appendix B
2) Per KDB447498 D01, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8W/kg for 1-g or 2.0W/kg for 10-g respectively, when the transmission band is ≤ 100MHz.
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz.
3) Maximum bandwidth does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

WiFi 2.4G:

1) 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.

WiFi 5G:

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.
3) 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.

NFC:

1) NFC SAR is measured for all edges and surfaces of the device.
2) NFC 13.56MHz antenna por is not available on the device to support conducted power measurement, therefore the measured results are referred to as reported SAR.
3) NFC SAR test tissue-simulating liquid parameter refer to IEC/IEEE 62209-1528 2020.

8.2.1 SAR Result of GSM850

GSM850 SAR Test Record										
Ant 0 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg) 1-g**	**Power drift (dB)**	**Conducted Power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled SAR 1-g (W/kg)**	**Liquid Temp.(℃)**
Head Test Data										
Left cheek	GPRS 4TS	190/836.6	1:2.075	0.090	0.06	26.03	27.00	1.250	0.113	22.4
Left tilted	GPRS 4TS	190/836.6	1:2.075	0.056	0.09	26.03	27.00	1.250	0.070	22.4
Right cheek	GPRS 4TS	190/836.6	1:2.075	0.140	0.11	26.03	27.00	1.250	0.175	22.4
Right tilted	GPRS 4TS	190/836.6	1:2.075	0.090	0.08	26.03	27.00	1.250	0.113	22.4
Body worn Test data(Separate 15mm)										
Front side	GPRS 4TS	190/836.6	1:2.075	0.142	0.06	26.03	27.00	1.250	0.178	23.0
Back side	GPRS 4TS	190/836.6	1:2.075	0.156	0.05	26.03	27.00	1.250	0.195	23.0
Hotspot Test data(Separate 10mm)										
Front side	GPRS 4TS	190/836.6	1:2.075	0.095	0.06	23.06	24.00	1.242	0.118	23.0
Back side	GPRS 4TS	190/836.6	1:2.075	0.116	0.08	23.06	24.00	1.242	0.144	23.0
Rightt side	GPRS 4TS	190/836.6	1:2.075	0.087	0.12	23.06	24.00	1.242	0.108	23.0
Bottom side	GPRS 4TS	190/836.6	1:2.075	0.082	0.07	23.06	24.00	1.242	0.102	23.0
Ant 1 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg) 1-g**	**Power drift (dB)**	**Conducted Power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled SAR 1-g (W/kg)**	**Liquid Temp.(℃)**
Head Test Data										
Left cheek	GPRS 4TS	190/836.6	1:2.075	0.467	0.13	25.42	26.50	1.282	0.599	22.4
Left tilted	GPRS 4TS	190/836.6	1:2.075	0.434	0.05	25.42	26.50	1.282	0.557	22.4
Right cheek	GPRS 4TS	190/836.6	1:2.075	0.520	-0.09	25.42	26.50	1.282	0.667	22.4
Right tilted	GPRS 4TS	190/836.6	1:2.075	0.440	0.01	25.42	26.50	1.282	0.564	22.4
Body worn Test data(Separate 15mm)										
Front side	GPRS 4TS	190/836.6	1:2.075	0.089	0.06	25.42	26.50	1.282	0.114	23.0
Back side	GPRS 4TS	190/836.6	1:2.075	0.109	0.11	25.42	26.50	1.282	0.140	23.0
Hotspot Test data(Separate 10mm)										
Front side	GPRS 4TS	190/836.6	1:2.075	0.066	0.11	22.54	23.50	1.247	0.082	23.0
Back side	GPRS 4TS	190/836.6	1:2.075	0.095	0.06	22.54	23.50	1.247	0.119	23.0
Left side	GPRS 4TS	190/836.6	1:2.075	0.000	0.13	22.54	23.50	1.247	0.000	23.0
Top side	GPRS 4TS	190/836.6	1:2.075	0.084	0.06	22.54	23.50	1.247	0.105	23.0

Table 10：SAR of GSM850 for Head, Body and Hotspot.

8.2.2 SAR Result of GSM1900

GSM1900 SAR Test Record										
Ant 1 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg) 1-g**	**Power drift (dB)**	**Conducted Power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled SAR 1-g (W/kg)**	**Liquid Temp.(℃)**
Head Test Data										
Left cheek	GPRS 4TS	661/1880	1:2.075	0.387	0.11	21.16	22.50	1.361	0.527	22.7
Left tilted	GPRS 4TS	661/1880	1:2.075	0.414	0.05	21.16	22.50	1.361	0.564	22.7
Right cheek	GPRS 4TS	661/1880	1:2.075	0.601	0.09	21.16	22.50	1.361	0.818	22.7
Right tilted	GPRS 4TS	661/1880	1:2.075	0.759	0.01	21.16	22.50	1.361	1.033	22.7
Right tilted	GPRS 4TS	512/1850.2	1:2.075	0.773	0.03	21.09	22.50	1.384	1.069	22.7
Right tilted	GPRS 4TS	810/1909.8	1:2.075	0.778	-0.04	20.87	22.50	1.455	1.132	22.7
Body worn Test data(Separate 15mm)										
Front side	GPRS 4TS	661/1880	1:2.075	0.096	0.05	21.56	23.00	1.393	0.134	22.8
Back side	GPRS 4TS	661/1880	1:2.075	0.166	0.12	21.56	23.00	1.393	0.231	22.8
Hotspot Test data(Separate 10mm)										
Front side	GPRS 4TS	661/1880	1:2.075	0.067	0.11	16.58	17.50	1.236	0.083	22.8
Back side	GPRS 4TS	661/1880	1:2.075	0.110	0.10	16.58	17.50	1.236	0.136	22.8
Left side	GPRS 4TS	661/1880	1:2.075	0.000	0.04	16.58	17.50	1.236	0.000	22.8
Top side	GPRS 4TS	661/1880	1:2.075	0.144	0.03	16.58	17.50	1.236	0.178	22.8
Ant 3 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg) 1-g**	**Power drift (dB)**	**Conducted Power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled SAR 1-g (W/kg)**	**Liquid Temp.(℃)**
Head Test Data										
Left cheek	GPRS 4TS	661/1880	1:2.075	0.067	0.08	24.54	25.50	1.247	0.084	22.7
Left tilted	GPRS 4TS	661/1880	1:2.075	0.048	0.00	24.54	25.50	1.247	0.060	22.7
Right cheek	GPRS 4TS	661/1880	1:2.075	0.057	0.10	24.54	25.50	1.247	0.071	22.7
Right tilted	GPRS 4TS	661/1880	1:2.075	0.000	0.01	24.54	25.50	1.247	0.000	22.7
Body worn Test data(Separate 15mm)										
Front side	GPRS 4TS	661/1880	1:2.075	0.136	0.13	24.54	25.50	1.247	0.170	22.8
Back side	GPRS 4TS	661/1880	1:2.075	0.140	0.05	24.54	25.50	1.247	0.175	22.8
Hotspot Test data(Separate 10mm)										
Front side	GPRS 4TS	661/1880	1:2.075	0.078	0.05	19.58	20.50	1.236	0.096	22.8
Back side	GPRS 4TS	661/1880	1:2.075	0.089	0.06	19.58	20.50	1.236	0.110	22.8
Left side	GPRS 4TS	661/1880	1:2.075	0.000	0.03	19.58	20.50	1.236	0.000	22.8
Rightt side	GPRS 4TS	661/1880	1:2.075	0.000	0.11	19.58	20.50	1.236	0.000	22.8
Bottom side	GPRS 4TS	661/1880	1:2.075	0.130	0.04	19.58	20.50	1.236	0.161	22.8

Table 11：SAR of GSM1900 for Head, Body and Hotspot.

8.2.3 SAR Result of WCDMA Band II

WCDMA Band II SAR Test Record										
Ant 1 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg) 1-g**	**Power drift (dB)**	**Conducted Power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled SAR 1-g (W/kg)**	**Liquid Temp.(℃)**
Head Test Data										
Left cheek	RMC	9400/1880	1:1	0.337	0.02	15.93	16.50	1.140	0.384	22.7
Left tilted	RMC	9400/1880	1:1	0.441	0.02	15.93	16.50	1.140	0.503	22.7
Right cheek	RMC	9400/1880	1:1	0.531	0.08	15.93	16.50	1.140	0.605	22.7
Right tilted	RMC	9400/1880	1:1	0.709	0.02	15.93	16.50	1.140	0.808	22.7
Right tilted	RMC	9262/1852.4	1:1	0.665	0.08	15.88	16.50	1.153	0.767	22.7
Right tilted	RMC	9538/1907.6	1:1	0.784	0.01	15.73	16.50	1.194	0.936	22.7
Body worn Test data(Separate 15mm)										
Front side	RMC	9400/1880	1:1	0.149	0.06	19.13	19.80	1.167	0.174	22.8
Back side	RMC	9400/1880	1:1	0.262	0.01	19.13	19.80	1.167	0.306	22.8
Hotspot Test data(Separate 10mm)										
Front side	RMC	9400/1880	1:1	0.092	0.04	13.96	14.80	1.213	0.112	22.8
Back side	RMC	9400/1880	1:1	0.158	0.08	13.96	14.80	1.213	0.192	22.8
Left side	RMC	9400/1880	1:1	0.000	0.02	13.96	14.80	1.213	0.000	22.8
Top side	RMC	9400/1880	1:1	0.230	0.12	13.96	14.80	1.213	0.279	22.8
Ant 3 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg) 1-g**	**Power drift (dB)**	**Conducted Power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled SAR 1-g (W/kg)**	**Liquid Temp.(℃)**
Head Test Data										
Left cheek	RMC	9400/1880	1:1	0.152	-0.02	24.07	25.00	1.239	0.188	22.7
Left tilted	RMC	9400/1880	1:1	0.123	0.08	24.07	25.00	1.239	0.152	22.7
Right cheek	RMC	9400/1880	1:1	0.127	0.01	24.07	25.00	1.239	0.157	22.7
Right tilted	RMC	9400/1880	1:1	0.092	0.13	24.07	25.00	1.239	0.114	22.7
Body worn Test data(Separate 15mm)										
Front side	RMC	9400/1880	1:1	0.264	0.03	22.80	23.70	1.230	0.325	22.8
Back side	RMC	9400/1880	1:1	0.286	-0.12	22.80	23.70	1.230	0.352	22.8
Hotspot Test data(Separate 10mm)										
Front side	RMC	9400/1880	1:1	0.172	0.01	17.82	18.70	1.225	0.211	22.8
Back side	RMC	9400/1880	1:1	0.173	-0.02	17.82	18.70	1.225	0.212	22.8
Left side	RMC	9400/1880	1:1	0.048	0.12	17.82	18.70	1.225	0.059	22.8
Rightt side	RMC	9400/1880	1:1	0.000	0.06	17.82	18.70	1.225	0.000	22.8
Bottom side	RMC	9400/1880	1:1	0.279	0.08	17.82	18.70	1.225	0.342	22.8

Table 12： SAR of WCDMA Band II for Head, Body and Hotspot.

8.2.4 SAR Result of WCDMA Band IV

WCDMA Band IV SAR Test Record										
Ant 1 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg) 1-g**	**Power drift (dB)**	**Conducted Power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled SAR 1-g (W/kg)**	**Liquid Temp.(℃)**
Head Test Data										
Left cheek	RMC	1412/1732.4	1:1	0.513	-0.01	21.44	22.50	1.276	0.655	22.6
Left tilted	RMC	1412/1732.4	1:1	0.666	0.05	21.44	22.50	1.276	0.850	22.6
Right cheek	RMC	1412/1732.4	1:1	0.732	0.01	21.44	22.50	1.276	0.934	22.6
Right tilted	RMC	1412/1732.4	1:1	0.850	-0.04	21.44	22.50	1.276	1.085	22.6
Right tilted	RMC	1312/1712.4	1:1	0.704	0.01	21.42	22.50	1.282	0.903	22.6
Right tilted	RMC	1513/1752.6	1:1	0.714	0.05	21.41	22.50	1.285	0.918	22.6
Head Test Data WWAN+WLAN5G+BT										
Left cheek	RMC	1412/1732.4	1:1	0.513	-0.01	21.44	17.50	0.404	0.207	22.6
Left tilted	RMC	1412/1732.4	1:1	0.666	0.05	21.44	17.50	0.404	0.269	22.6
Right cheek	RMC	1412/1732.4	1:1	0.732	0.01	21.44	17.50	0.404	0.295	22.6
Right tilted	RMC	1412/1732.4	1:1	0.850	-0.04	21.44	17.50	0.404	0.343	22.6
Right tilted	RMC	1312/1712.4	1:1	0.704	0.01	21.42	17.50	0.406	0.285	22.6
Right tilted	RMC	1513/1752.6	1:1	0.714	0.05	21.41	17.50	0.406	0.290	22.6
Body worn Test data(Separate 15mm)										
Front side	RMC	1412/1732.4	1:1	0.081	0.03	20.95	22.00	1.274	0.103	22.6
Back side	RMC	1412/1732.4	1:1	0.154	0.07	20.95	22.00	1.274	0.196	22.6
Hotspot Test data(Separate 10mm)										
Front side	RMC	1412/1732.4	1:1	0.053	0.10	15.93	17.00	1.279	0.068	22.6
Back side	RMC	1412/1732.4	1:1	0.105	-0.01	15.93	17.00	1.279	0.134	22.6
Left side	RMC	1412/1732.4	1:1	0.000	0.11	15.93	17.00	1.279	0.000	22.6
Top side	RMC	1412/1732.4	1:1	0.126	0.09	15.93	17.00	1.279	0.161	22.6
Ant 3 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg) 1-g**	**Power drift (dB)**	**Conducted Power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled SAR 1-g (W/kg)**	**Liquid Temp.(℃)**
Head Test Data										
Left cheek	RMC	1412/1732.4	1:1	0.141	0.12	24.28	25.00	1.180	0.166	22.6
Left tilted	RMC	1412/1732.4	1:1	0.090	0.02	24.28	25.00	1.180	0.106	22.6
Right cheek	RMC	1412/1732.4	1:1	0.156	0.06	24.28	25.00	1.180	0.184	22.6
Right tilted	RMC	1412/1732.4	1:1	0.107	0.11	24.28	25.00	1.180	0.126	22.6
Body worn Test data(Separate 15mm)										
Front side	RMC	1412/1732.4	1:1	0.230	0.03	22.68	23.30	1.153	0.265	22.6
Back side	RMC	1412/1732.4	1:1	0.258	0.05	22.68	23.30	1.153	0.298	22.6
Hotspot Test data(Separate 10mm)										
Front side	RMC	1412/1732.4	1:1	0.169	0.09	17.71	18.30	1.146	0.194	22.6
Back side	RMC	1412/1732.4	1:1	0.178	0.09	17.71	18.30	1.146	0.204	22.6
Left side	RMC	1412/1732.4	1:1	0.058	0.04	17.71	18.30	1.146	0.066	22.6
Rightt side	RMC	1412/1732.4	1:1	0.000	0.09	17.71	18.30	1.146	0.000	22.6
Bottom side	RMC	1412/1732.4	1:1	0.242	0.07	17.71	18.30	1.146	0.277	22.6

Table 13： SAR of WCDMA Band IV for Head, Body and Hotspot.

Test Position	Channel/ Frequency (MHz)	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	3rd Repeated SAR (1g)
Right tilted	1412/1732.4	0.85	0.839	1.013110846	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 preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements 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 preformed 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						