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SAR CHARACTERIZATION AND EVALUATION REPORT

Applicant Name:
Samsung Electronics Co., Ltd.
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Gyeonggi-do, 16677, Korea

Date of Testing:
09/12/23 - 10/28/23
Test Site/Location:
Element, Columbia, MD, USA
Document Serial No.:
1M2309070100-15.A3L

FCC ID: A3LSMA156U

APPLICANT: SAMSUNG ELECTRONICS CO., LTD.

DUT Type: Portable Handset
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model(s): SM-A156U, SM-A156U1/DS, SM-S156V

Equipment Class	Band & Mtds	Tx Frequency	SAR			
			1g Head (W/kg)	1g Body/Worn (W/kg)	1g Hotspot (W/kg)	10g Phablet (W/kg)
PCE	GSMGPRS/EDGE 850	824.20 - 848.80 MHz	0.28	0.65	0.62	N/A
PCE	GSMGPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.09	0.14	0.23	N/A
PCE	UMTS 850	826.40 - 846.60 MHz	0.18	0.61	0.61	N/A
PCE	UMTS 1750	1712.4 - 1752.6 MHz	0.16	0.26	0.31	N/A
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.12	0.19	0.27	N/A
PCE	LTE Band 71	665.5 - 695.5 MHz	0.17	0.46	0.46	N/A
PCE	LTE Band 12	699.7 - 715.3 MHz	0.22	0.54	0.54	N/A
PCE	LTE Band 13	728.5 - 784.5 MHz	0.24	0.27	0.27	N/A
PCE	LTE Band 14	750.5 - 785.5 MHz	0.20	0.28	0.28	N/A
PCE	LTE Band 26	814.7 - 848.3 MHz	0.30	0.65	0.65	N/A
PCE	LTE Band 5	824.7 - 848.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 36	1710.7 - 1779.3 MHz	0.21	0.19	0.22	N/A
PCE	LTE Band 4	1710.7 - 1754.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 25	1850.7 - 1914.3 MHz	0.53	0.17	0.21	N/A
PCE	LTE Band 2	1850.7 - 1909.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 30	2307.5 - 2372.5 MHz	0.14	0.11	0.11	N/A
PCE	LTE Band 7	2502.5 - 2567.5 MHz	0.39	0.29	0.29	N/A
PCE	LTE Band 41	2502.5 - 2680 MHz	0.29	0.52	0.52	N/A
PCE	LTE Band 38	2572.5 - 2617.5 MHz	N/A	N/A	N/A	N/A
CBE	LTE Band 49	3652.5 - 3697.5 MHz	0.42	0.61	0.61	N/A
PCE	NR Band n71	665.5 - 695.5 MHz	0.20	0.36	0.38	N/A
PCE	NR Band n5	826.5 - 846.5 MHz	0.36	0.53	0.53	N/A
PCE	NR Band n70	1697.5 - 1707.5 MHz	0.27	0.38	0.43	N/A
PCE	NR Band n66	1712.5 - 1772.5 MHz	0.45	0.19	0.22	N/A
PCE	NR Band n25	1852.5 - 1912.5 MHz	0.21	0.29	0.29	N/A
PCE	NR Band n2	1852.5 - 1907.5 MHz	0.56	0.19	0.24	N/A
PCE	NR Band n41	2501.01 - 2585 MHz	0.15	0.26	0.26	1.07
CBE	NR Band n48	3655 - 3687.48 MHz	0.18	0.42	0.42	1.48
PCE	NR Band n78	3455.01 - 3544.98 MHz	N/A	N/A	N/A	N/A
PCE	NR Band n77	3705 - 3795 MHz	0.33	0.24	0.24	1.16
DTS	2.4 GHz WiFi	2412 - 2472 MHz	0.12	0.29	0.29	N/A
NI	5 GHz WiFi	U-NII-1: 5180 - 5240 MHz U-NII-2A: 5260 - 5320 MHz U-NII-2C: 5500 - 5720 MHz U-NII-3: 5745 - 5825 MHz	0.56	0.32	0.47	0.60
DSS	2.4 GHz Bluetooth	2402 - 2480 MHz	<0.1	<0.1	<0.1	N/A
DXC	NFC	13.56 MHz	N/A	N/A	N/A	<0.1
Simultaneous SAR per KDB 690783 D01v01r03:			1.58	1.53	1.53	3.80

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.9 of this report; for North American frequency bands only.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

RJ Ortanez
Executive Vice President



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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26	Voice/Data	814.7 - 848.3 MHz
LTE Band 5	Voice/Data	824.7 - 848.3 MHz
LTE Band 66	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n70	Voice/Data	1697.5 - 1707.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n78	Voice/Data	3455.01 - 3544.98 MHz; 3705 - 3795 MHz
NR Band n77	Voice/Data	3455.01 - 3544.98 MHz; 3705 - 3975 MHz
2.4 GHz WIFI	Voice/Data	2412 - 2472 MHz
5 GHz WIFI	Voice/Data	U-NII-1: 5180 - 5240 MHz U-NII-2A: 5260 - 5320 MHz U-NII-2C: 5500 - 5720 MHz U-NII-3: 5745 - 5825 MHz
2.4 GHz Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz

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1.2 Time-Averaging Algorithm for RF Exposure Compliance

The purpose of this report is to show SAR Characterization of WWAN sub-6/WLAN (Part0) and to demonstrate that the EUT meets FCC SAR limits when transmitting in static transmission scenario at maximum allowable time-averaged power levels (Part1).

1.2.1 Nomenclature

Technology	Term	Description
WWAN Sub-6 /WLAN	P_{limit}	Power level that corresponds to the exposure design target (SAR_{design_target}) after accounting for all device design related uncertainties
	P_{max}	Maximum tune up output power
	SAR_{design_target}	Target SAR level < FCC SAR limit after accounting for all device design related uncertainties
	SAR_{Char}	Table containing P_{limit} for all technologies and bands

1.2.2 Time-Averaged Algorithm

This Device is enabled with MediaTek TAS feature for WWAN modes and WLAN technologies. These features perform time averaging algorithm in real time to control and manage transmitting power and ensure the time-averaged RF exposure is in compliance with FCC requirements all the time. Refer to Compliance Summary document for detailed description of MediaTek TAS feature (report SN could be found in Section 1.11 – Bibliography).

Note that Bluetooth and NFC operations are not enabled with TAS.

The TAS algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of SAR_{design_target} , below the predefined time-averaged power limit (i.e., P_{limit} for WWAN sub-6/WLAN radio), for each characterized technology and band. Characterization is achieved by determining P_{limit} for WWAN sub-6/WLAN/BT that corresponds to the exposure design targets after accounting for all device design related uncertainties, i.e., SAR_{design_target} (<FCC SAR Limit) for sub-6 radio. The SAR characterization is denoted as SAR char in this report (see SAR Summary Section and Part 0 SAR Test Results for P_{limit} Calculations Appendix).

TAS allows the device to transmit at higher power instantaneously, as high as P_{max} , when needed, but enforces power limiting to maintain time-averaged transmit power to P_{limit} . Below table shows Final P_{limit} settings and maximum tune up output power P_{max} configured for this EUT for various transmit conditions (Exposure Condition Index ECI for MediaTek). Note that the device uncertainty for sub-6GHz WWAN is 1.0dB for this EUT.

The maximum time-averaged output power (dBm) for any WWAN sub-6/WLAN technology, band, and ECI is the minimum of ("Plimit " and "Maximum tune up output power P_{max} ") + 1dB device uncertainty. SAR values in this report were scaled to this maximum time-averaged output power to determine compliance per KDB Publication 447498 D01v06.

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1.3 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.

1.3.1 Licensed Output Power

GSM/GPRS/EDGE 850										
Antenna A										
Power Level		Voice (in dBm)	Data - Burst Average GMSK (in dBm)				Data - Burst Average 8-PSK (in dBm)			
		1 TX Slot	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
Pmax	Max Allowed Power	33.5	33.5	30.5	29.0	27.5	27.5	24.5	23.0	21.5
	Nominal	32.5	32.5	29.5	28.0	26.5	26.5	23.5	22.0	20.5
ECI = 4 (Body-Worn or Phablet)	Max Allowed Power	33.5	33.5	30.5	29.0	27.5	27.5	24.5	23.0	21.5
	Nominal	32.5	32.5	29.5	28.0	26.5	26.5	23.5	22.0	20.5
ECI = 1 (Head)	Max Allowed Power	33.5	33.5	30.5	29.0	27.5	27.5	24.5	23.0	21.5
	Nominal	32.5	32.5	29.5	28.0	26.5	26.5	23.5	22.0	20.5
ECI = 2 (Hotspot)	Max Allowed Power	N/A	33.5	30.5	29.0	27.5	27.5	24.5	23.0	21.5
	Nominal	N/A	32.5	29.5	28.0	26.5	26.5	23.5	22.0	20.5
ECI = 3 (Earjack)	Max Allowed Power	33.5	33.5	30.5	29.0	27.5	27.5	24.5	23.0	21.5
	Nominal	32.5	32.5	29.5	28.0	26.5	26.5	23.5	22.0	20.5
GSM/GPRS/EDGE 1900										
Antenna B										
Power Level		Voice (in dBm)	Data - Burst Average GMSK (in dBm)				Data - Burst Average 8-PSK (in dBm)			
		1 TX Slot	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
Pmax	Max Allowed Power	30.5	30.5	28.0	26.0	25.0	26.5	23.5	22.0	21.0
	Nominal	29.5	29.5	27.0	25.0	24.0	25.5	22.5	21.0	20.0
ECI = 4 (Body-Worn or Phablet)	Max Allowed Power	30.5	30.5	28.0	26.0	25.0	26.5	23.5	22.0	21.0
	Nominal	29.5	29.5	27.0	25.0	24.0	25.5	22.5	21.0	20.0
ECI = 1 (Head)	Max Allowed Power	30.5	30.5	28.0	26.0	25.0	26.5	23.5	22.0	21.0
	Nominal	29.5	29.5	27.0	25.0	24.0	25.5	22.5	21.0	20.0
ECI = 2 (Hotspot)	Max Allowed Power	N/A	30.5	28.0	26.0	25.0	26.5	23.5	22.0	21.0
	Nominal	N/A	29.5	27.0	25.0	24.0	25.5	22.5	21.0	20.0
ECI = 3 (Earjack)	Max Allowed Power	30.5	30.5	28.0	26.0	25.0	26.5	23.5	22.0	21.0
	Nominal	29.5	29.5	27.0	25.0	24.0	25.5	22.5	21.0	20.0

For GSM, the above powers listed are GSM burst average values.

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UMTS Band 5 (850 MHz)					
Antenna A					
Power Level		Modulated Average Output Power			
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 5	3GPP HSUPA Rel 6	3GPP DC-HSDPA Rel 8
Pmax	Max Allowed Power	25.5	25.5	22.5	24.5
	Nominal	24.5	24.5	21.5	23.5
ECI = 4 (Body-Worn or Phablet)	Max Allowed Power	24.0	24.0	22.0	24.0
	Nominal	23.0	23.0	21.0	23.0
ECI = 1 (Head)	Max Allowed Power	24.0	24.0	22.0	24.0
	Nominal	23.0	23.0	21.0	23.0
ECI = 2 (Hotspot)	Max Allowed Power	24.0	24.0	22.0	24.0
	Nominal	23.0	23.0	21.0	23.0
ECI = 3 (Earjack)	Max Allowed Power	24.0	24.0	22.0	24.0
	Nominal	23.0	23.0	21.0	23.0
UMTS Band 4 (1750 MHz)					
Antenna B					
Power Level		Modulated Average Output Power			
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 5	3GPP HSUPA Rel 6	3GPP DC-HSDPA Rel 8
Pmax	Max Allowed Power	25.0	25.0	22.0	24.0
	Nominal	24.0	24.0	21.0	23.0
ECI = 4 (Body-Worn or Phablet)	Max Allowed Power	21.0	21.0	21.0	21.0
	Nominal	20.0	20.0	20.0	20.0
ECI = 1 (Head)	Max Allowed Power	23.5	23.5	22.0	23.5
	Nominal	22.5	22.5	21.0	22.5
ECI = 2 (Hotspot)	Max Allowed Power	21.0	21.0	21.0	21.0
	Nominal	20.0	20.0	20.0	20.0
ECI = 3 (Earjack)	Max Allowed Power	21.0	21.0	21.0	21.0
	Nominal	20.0	20.0	20.0	20.0
UMTS Band 2 (1900 MHz)					
Antenna B					
Power Level		Modulated Average Output Power			
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 5	3GPP HSUPA Rel 6	3GPP DC-HSDPA Rel 8
Pmax	Max Allowed Power	25.0	25.0	22.0	24.0
	Nominal	24.0	24.0	21.0	23.0
ECI = 4 (Body-Worn or Phablet)	Max Allowed Power	21.0	21.0	19.0	21.0
	Nominal	20.0	20.0	18.0	20.0
ECI = 1 (Head)	Max Allowed Power	23.0	23.0	22.0	23.0
	Nominal	22.0	22.0	21.0	22.0
ECI = 2 (Hotspot)	Max Allowed Power	21.0	21.0	19.0	21.0
	Nominal	20.0	20.0	18.0	20.0
ECI = 3 (Earjack)	Max Allowed Power	21.0	21.0	19.0	21.0
	Nominal	20.0	20.0	18.0	20.0

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Mode / Band	Antenna		Modulated Average Output Power (in dBm)				
			Pmax	ECI = 4 (Body-Worn or Phablet)	ECI = 1 (Head)	ECI = 2 (Hotspot)	ECI = 3 (Earjack)
LTE Band 71	A	Max Allowed Power	25.5	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5	24.5
LTE Band 12	A	Max Allowed Power	25.5	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5	24.5
LTE Band 13	A	Max Allowed Power	24.5	21.5	24.5	21.5	21.5
		Nominal	23.5	20.5	23.5	20.5	20.5
LTE Band 14	A	Max Allowed Power	24.5	21.5	24.5	21.5	21.5
		Nominal	23.5	20.5	23.5	20.5	20.5
LTE Band 26/5	A	Max Allowed Power	25.5	24.5	25.5	24.5	24.5
		Nominal	24.5	23.5	24.5	23.5	23.5
LTE Band 66/4	B	Max Allowed Power	25.5	20.5	25.5	20.5	20.5
		Nominal	24.5	19.5	24.5	19.5	19.5
LTE Band 66/4	C	Max Allowed Power	25.5	21.0	22.5	21.0	21.0
		Nominal	24.5	20.0	21.5	20.0	20.0
LTE Band 25/2	B	Max Allowed Power	25.5	20.5	25.5	20.5	20.5
		Nominal	24.5	19.5	24.5	19.5	19.5
LTE Band 25/2	C	Max Allowed Power	25.5	21.0	22.5	21.0	21.0
		Nominal	24.5	20.0	21.5	20.0	20.0
LTE Band 30	B	Max Allowed Power	24.0	20.0	24.0	20.0	20.0
		Nominal	23.0	19.0	23.0	19.0	19.0
LTE Band 7	B	Max Allowed Power	24.0	20.0	24.0	20.0	20.0
		Nominal	23.0	19.0	23.0	19.0	19.0
LTE Band 41 PC3	B	Max Allowed Power	25.0	24.0	23.4	24.0	24.0
		Nominal	24.0	23.0	22.4	23.0	23.0
LTE Band 41 PC2	B	Max Allowed Power	26.5	25.6	25.0	25.6	25.6
		Nominal	25.5	24.6	24.0	24.6	24.6
LTE Band 38	B	Max Allowed Power	24.0	24.0	23.4	24.0	24.0
		Nominal	23.0	23.0	22.4	23.0	23.0
LTE Band 48	F	Max Allowed Power	24.0	24.0	20.0	24.0	24.0
		Nominal	23.0	23.0	19.0	23.0	23.0

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			Pmax	EI = 4 (Body-Worn or Phablet)	EI = 1 (Head)	EI = 2 (Hotspot)	EI = 3 (Earjack)
NR Band n71	A	Max Allowed Power	25.5	25.5	25.5	25.5	25.5
		Nominal	24.5	24.5	24.5	24.5	24.5
NR Band n5	A	Max Allowed Power	25.5	24.5	25.5	24.5	24.5
		Nominal	24.5	23.5	24.5	23.5	23.5
NR Band n70	B	Max Allowed Power	25.5	23.0	25.5	23.0	23.0
		Nominal	24.5	22.0	24.5	22.0	22.0
NR Band n66	B	Max Allowed Power	25.5	20.5	25.5	20.5	20.5
		Nominal	24.5	19.5	24.5	19.5	19.5
NR Band n66	C	Max Allowed Power	25.5	21.0	22.5	21.0	21.0
		Nominal	24.5	20.0	21.5	20.0	20.0
NR Band n70	B	Max Allowed Power	25.5	23.0	25.5	23.0	23.0
		Nominal	24.5	22.0	24.5	22.0	22.0
NR Band n25/n2	B	Max Allowed Power	25.5	20.5	25.5	20.5	20.5
		Nominal	24.5	19.5	24.5	19.5	19.5
NR Band n2	C	Max Allowed Power	25.5	21.0	22.5	21.0	21.0
		Nominal	24.5	20.0	21.5	20.0	20.0
NR Band n41 PC3	B	Max Allowed Power	24.0	18.0	19.0	18.0	18.0
		Nominal	23.0	17.0	18.0	17.0	17.0
NR Band n41 PC2	B	Max Allowed Power	27.0	18.0	19.0	18.0	18.0
		Nominal	26.0	17.0	18.0	17.0	17.0
NR Band n48	F	Max Allowed Power	24.0	18.0	14.0	18.0	18.0
		Nominal	23.0	17.0	13.0	17.0	17.0
NR Band n48	E	Max Allowed Power	15.0	15.0	12.0	15.0	15.0
		Nominal	14.0	14.0	11.0	14.0	14.0
NR Band n48	H	Max Allowed Power	12.5	12.5	9.5	12.5	12.5
		Nominal	11.5	11.5	8.5	11.5	11.5
NR Band n48	G	Max Allowed Power	13.0	13.0	10.0	13.0	13.0
		Nominal	12.0	12.0	9.0	12.0	12.0
NR Band n78 PC3	F	Max Allowed Power	24.0	17.0	16.0	17.0	17.0
		Nominal	23.0	16.0	15.0	16.0	16.0
NR Band n78 PC3	E	Max Allowed Power	15.0	14.0	13.0	14.0	14.0
		Nominal	14.0	13.0	12.0	13.0	13.0
NR Band n78 PC3	H	Max Allowed Power	12.0	10.0	9.0	10.0	10.0
		Nominal	11.0	9.0	8.0	9.0	9.0
NR Band n78 PC3	G	Max Allowed Power	13.0	11.5	10.5	11.5	11.5
		Nominal	12.0	10.5	9.5	10.5	10.5
NR Band n78 PC2	F	Max Allowed Power	27.0	17.0	16.0	17.0	17.0
		Nominal	26.0	16.0	15.0	16.0	16.0
NR Band n78 PC2	E	Max Allowed Power	15.0	14.0	13.0	14.0	14.0
		Nominal	14.0	13.0	12.0	13.0	13.0
NR Band n78 PC2	H	Max Allowed Power	12.0	10.0	9.0	10.0	10.0
		Nominal	11.0	9.0	8.0	9.0	9.0
NR Band n78 PC2	G	Max Allowed Power	13.0	11.5	10.5	11.5	11.5
		Nominal	12.0	10.5	9.5	10.5	10.5
NR Band n77 PC3	F	Max Allowed Power	24.0	17.0	16.0	17.0	17.0
		Nominal	23.0	16.0	15.0	16.0	16.0
NR Band n77 PC3	E	Max Allowed Power	15.0	14.0	13.0	14.0	14.0
		Nominal	14.0	13.0	12.0	13.0	13.0
NR Band n77 PC3	H	Max Allowed Power	12.5	10.0	9.0	10.0	10.0
		Nominal	11.5	9.0	8.0	9.0	9.0
NR Band n77 PC3	G	Max Allowed Power	13.0	11.5	10.5	11.5	11.5
		Nominal	12.0	10.5	9.5	10.5	10.5
NR Band n77 PC2	F	Max Allowed Power	27.0	17.0	16.0	17.0	17.0
		Nominal	26.0	16.0	15.0	16.0	16.0
NR Band n77 PC2	E	Max Allowed Power	15.0	14.0	13.0	14.0	14.0
		Nominal	14.0	13.0	12.0	13.0	13.0
NR Band n77 PC2	H	Max Allowed Power	12.5	10.0	9.0	10.0	10.0
		Nominal	11.5	9.0	8.0	9.0	9.0
NR Band n77 PC2	G	Max Allowed Power	13.0	11.5	10.5	11.5	11.5
		Nominal	12.0	10.5	9.5	10.5	10.5

For LTE TDD and NR TDD, the above powers listed are TDD burst average values.

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1.3.2 2.4 GHz WLAN Output Power

The below table is applicable is applicable in the following conditions:

- Pmax, ECI=0 (Body-worn or Phablet or Hotspot or Earjack)

Band	Power Level	IEEE 802.11 Modulated Output Power (in dBm)					
		SISO					
		Antenna E					
		b		g		n	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.
2.4 GHz WLAN	2.45 GHz	21.0	20.0	20.0	19.0	20.0	19.0
		ch. 12: 6.0	5.0	ch. 12: 6.0	5.0	ch. 12: 6.0	5.0
		ch. 13: 6.0	5.0	ch. 13: 6.0	5.0	ch. 13: 6.0	5.0

The below table is applicable is applicable in the following conditions:

- ECI=1 (RCV)

Band	Power Level	IEEE 802.11 Modulated Output Power (in dBm)					
		SISO					
		Antenna E					
		b		g		n	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.
2.4 GHz WLAN	2.45 GHz	14.0	13.0	14.0	13.0	14.0	13.0
		ch. 12: 6.0	5.0	ch. 12: 6.0	5.0	ch. 12: 6.0	5.0
		ch. 13: 6.0	5.0	ch. 13: 6.0	5.0	ch. 13: 6.0	5.0

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1.3.3 5 GHz WLAN Output Power

The below table is applicable is applicable in the following conditions:

- Pmax

		IEEE 802.11 Modulated Output Power (in dBm)					
Mode	Band	SISO					
		Antenna E					
		a		n		ac	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.
5 GHz WiFi (20MHz BW)	UNII-1	20.0	19.0	20.0	19.0	18.0	17.0
	UNII-2A	20.0	19.0	20.0	19.0	18.0	17.0
	UNII-2C	20.0	19.0	20.0	19.0	18.0	17.0
	UNII-3	20.0	19.0	20.0	19.0	18.0	17.0
5 GHz WiFi (40MHz BW)	UNII-1			18.0	17.0	18.0	17.0
	UNII-2A			18.0	17.0	18.0	17.0
	UNII-2C			ch. 62: 16.5	15.5	ch. 62: 16.5	15.5
	UNII-3			18.0	17.0	18.0	17.0
5 GHz WiFi (80MHz BW)	UNII-1					14.0	13.0
	UNII-2A					14.0	13.0
	UNII-2C					14.0	13.0
	UNII-3					14.0	13.0

The below table is applicable is applicable in the following conditions:

- ECI=0 (Body-worn or Phablet or Hotspot or Earjack)

		IEEE 802.11 Modulated Output Power (in dBm)					
Mode	Band	SISO					
		Antenna E					
		a		n		ac	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.
5 GHz WiFi (20MHz BW)	UNII-1	15.0	14.0	15.0	14.0	15.0	14.0
	UNII-2A	15.0	14.0	15.0	14.0	15.0	14.0
	UNII-2C	15.0	14.0	15.0	14.0	15.0	14.0
	UNII-3	15.0	14.0	15.0	14.0	15.0	14.0
5 GHz WiFi (40MHz BW)	UNII-1			15.0	14.0	15.0	14.0
	UNII-2A			15.0	14.0	15.0	14.0
	UNII-2C			15.0	14.0	15.0	14.0
	UNII-3			15.0	14.0	15.0	14.0
5 GHz WiFi (80MHz BW)	UNII-1					14.0	13.0
	UNII-2A					14.0	13.0
	UNII-2C					14.0	13.0
	UNII-3					14.0	13.0

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The below table is applicable in the following conditions:

- ECI=1(RCV)

Mode	Band	IEEE 802.11 Modulated Output Power (in dBm)					
		SISO					
		Antenna E					
Maximum / Nominal Power		a		n		ac	
		Max	Nom.	Max	Nom.	Max	Nom.
5 GHz WiFi (20MHz BW)	UNII-1	13.0	12.0	13.0	12.0	13.0	12.0
	UNII-2A	13.0	12.0	13.0	12.0	13.0	12.0
	UNII-2C	13.0	12.0	13.0	12.0	13.0	12.0
	UNII-3	13.0	12.0	13.0	12.0	13.0	12.0
5 GHz WiFi (40MHz BW)	UNII-1			13.0	12.0	13.0	12.0
	UNII-2A			13.0	12.0	13.0	12.0
	UNII-2C			13.0	12.0	13.0	12.0
	UNII-3			13.0	12.0	13.0	12.0
5 GHz WiFi (80MHz BW)	UNII-1					13.0	12.0
	UNII-2A					13.0	12.0
	UNII-2C					13.0	12.0
	UNII-3					13.0	12.0

1.3.4 2.4 GHz Maximum Bluetooth Output Power

Mode	Data Rate	Modulated Output Power (in dBm)	
		SISO	
		Antenna E	
Maximum / Nominal Power		Max	Nom.
Bluetooth	1Mbps	11.0	10.0
Bluetooth EDR	2Mbps	7.5	6.5
Bluetooth EDR	3Mbps	7.5	6.5
Bluetooth LE	1Mbps	6.5	5.5
Bluetooth LE	2Mbps	6.5	5.5

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1.4 DUT Antenna Locations

The overall dimensions of this device are > 9 x 5 cm. A diagram showing the location of the device antennas can be found in DUT Antenna Diagram & SAR Test Setup Photographs Appendix. Since the display diagonal dimension of this device is > 150 mm and <200 mm, it is considered a “phablet.” Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filing.

**Table 1-1
Device Edges/Sides for SAR Testing**

Antenna	Back	Front	Top	Bottom	Right	Left
A	Yes	Yes	No	Yes	Yes	Yes
B	Yes	Yes	No	Yes	No	Yes
C	Yes	Yes	Yes	No	No	Yes
E	Yes	Yes	Yes	No	No	Yes
F	Yes	Yes	Yes	No	No	Yes
G	Yes	Yes	Yes	No	Yes	No
H	Yes	Yes	Yes	No	No	Yes

Note: Particular DUT edges were not required to be evaluated for wireless router SAR or phablet SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v02r01 Section III and FCC KDB Publication 648474 D01v06r03. The distances between the transmit antennas and the edges of the device are included in the filing. When wireless router mode is enabled, U-NII-1, U-NII-2A, and U-NII-2C operations are disabled.

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1.5 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the device for this model. Therefore, all SAR tests were performed with the device which already incorporates the NFC antenna. A diagram showing the location of the NFC antenna can be found in DUT Antenna Diagram & SAR Test Setup Photographs Appendix.

1.6 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds.

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v06 procedures.

**Table 1-2
Simultaneous Transmission Scenarios**

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN	Yes	Yes	N/A	Yes	
2	GSM voice + 5 GHz WLAN	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz Bluetooth	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
4	GSM voice + 5 GHz WLAN + 2.4 GHz Bluetooth	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
5	UMTS + 2.4 GHz WLAN	Yes	Yes	Yes	Yes	
6	UMTS + 5 GHz WLAN	Yes	Yes	Yes	Yes	
7	UMTS + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
8	UMTS + 5 GHz WLAN + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
9	LTE + 2.4 GHz WLAN	Yes	Yes	Yes	Yes	
10	LTE + 5 GHz WLAN	Yes	Yes	Yes	Yes	
11	LTE + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
12	LTE + 5 GHz WLAN + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
13	LTE + NR	Yes	Yes	N/A	Yes	
14	LTE + NR + 2.4 GHz WLAN	Yes	Yes	Yes	Yes	
15	LTE + NR + 5 GHz WLAN	Yes	Yes	Yes	Yes	
16	LTE + NR + 2.4 GHz Bluetooth	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	LTE + NR + 5 GHz WLAN + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
18	NR + 2.4 GHz WLAN	Yes	Yes	Yes	Yes	
19	NR + 5 GHz WLAN	Yes	Yes	Yes	Yes	
20	NR + 2.4 GHz Bluetooth	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
21	NR + 5 GHz WLAN + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
22	GPRS/EDGE + 2.4 GHz WLAN	N/A	N/A	Yes	Yes	
23	GPRS/EDGE + 5 GHz WLAN	N/A	N/A	Yes	Yes	
24	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
25	GPRS/EDGE + 5 GHz WLAN + 2.4 GHz Bluetooth	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

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1. No other simultaneous scenarios besides described above is supported for this model.
2. When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
3. Per the manufacturer, WIFI Direct is not expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Therefore, there are no simultaneous transmission scenarios involving WIFI direct beyond that listed in the above table.
4. 5 GHz Wireless Router is only supported for the U-NII-3 by S/W, therefore U-NII-1, U-NII-2A, and U-NII-2C were not evaluated for wireless router conditions.
5. This device supports VoWIFI.
6. This device supports Bluetooth Tethering.
7. This device supports VoLTE.
8. This device supports VoNR.
9. LTE + 5G NR FR1 Scenarios are limited to EN-DC combinations with anchor bands as shown in the NR FR1 checklist.
10. NFC were evaluated for phablet based on expected usage conditions.

1.7 Miscellaneous SAR Test Considerations

(A) WIFI/BT

Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02.

This device supports channel 1-13 for 2.4 GHz WLAN. However, because channel 12/13 targets are not higher than that of channels 1-11, channels 1, 6, and 11 were considered for SAR testing per FCC KDB 248227 D01V02r02.

Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, and U-NII-2C, WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01.

This device supports IEEE 802.11ac with the following features:

- a) Up to 80 MHz Bandwidth only for 5 GHz
- b) Up to 256 QAM is supported
- c) TDWR and Band gap channels are supported for 5 GHz

Per FCC KDB Publication 648474 D01v06r03, this device is considered a "phablet" since the display diagonal dimension is greater than 150mm and less than 200mm. Phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg. Because wireless router operations are not supported for U-NII-1, U-NII-2A, and U-NII-2C WLAN, phablet SAR tests were performed. Phablet SAR was not evaluated for 2.4 GHz WLAN, 2.4 GHz Bluetooth, and U-NII-3 WLAN operations since wireless router 1g SAR was < 1.2 W/kg.

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(B) Licensed Transmitter(s)

GSM/GPRS/EDGE DTM is not supported for US bands. Therefore, the GSM Voice modes in this report do not transmit simultaneously with GPRS/EDGE Data.

This device is only capable of QPSK HSUPA in the uplink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA in KDB 941225 D01v03r01.

LTE SAR for the higher modulations and lower bandwidths were not tested since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth; and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg for all configurations according to FCC KDB 941225 D05v02r04.

This device supports LTE Carrier Aggregation (CA) in the downlink. All uplink communications are identical to Release 8 specifications. Per FCC KDB Publication 941225 D05A v01r02, SAR for LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive. The downlink carrier aggregation exclusion analysis can be found in Downlink LTE CA RF Conducted Powers Appendix.

Per FCC KDB Publication 648474 D01v06r03, this device is considered a "phablet" since the display diagonal dimension is greater than 150mm and less than 200mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.

This device supports downlink 4x4 MIMO operations for some LTE Bands. Per May 2017 TCB Workshop Notes, SAR for 4x4 DL MIMO was not needed since the maximum average output power in 4x4 DL MIMO mode was not more than 0.25 dB higher than the maximum output power with 4x4 DL MIMO inactive.

This device supports LTE/NR capabilities with overlapping transmission frequency ranges. When the supported frequency range of an LTE/NR Band falls completely within an LTE/NR band with a larger transmission frequency range, both LTE/NR bands have the same target power (or the band with the larger transmission frequency range has a higher target power), and both LTE/NR bands share the same transmission path and signal characteristics, SAR was only assessed for the band with the larger transmission frequency range.

This device supports both Power Class 2 (PC2) and Power Class 3 (PC3) for LTE Band 41. Per May 2017 TCB Workshop Notes, SAR tests were performed with Power Class 3 (given the specific UL/DL limitations for Power Class 2). Additionally, SAR testing for the power class 2 condition was evaluated for the highest configuration in Power Class 3 for each test configuration to confirm the results were scalable linearly (See Section 13).

This device supports LTE Carrier Aggregation (CA) for LTE Band 41, and LTE Band 48 with two component carriers in the uplink. SAR Measurements and conducted powers were evaluated per 2017 Fall TCB Workshop Notes.

This device can transmit with antenna C for LTE B2/4/25/66 and NR Band n2/66. SAR tests for antenna C, were additionally performed for these LTE and NR bands to ensure compliance.

Per FCC Guidance, C-Band for NR n77 (3705 – 3975 MHz) was fully tested according to FCC procedures. For each exposure condition and antenna, the worst-case position was additionally evaluated for the NR n77 DoD (3455.01 – 3544.98 MHz).

NR implementation supports SA and NSA mode. In EN-DC mode, NR operates with the LTE Bands shown in the NR FR1 checklist acting as anchor bands. Per FCC guidance, SAR tests for NR Bands and LTE Anchors Bands were performed separately due to limitations in SAR probe calibration factors.

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Per MTK guidance, SRS was tested with modulated signal. DFT-s-OFDM QPSK was used as the lowest order modulation and RB Size/Offset was selected to resemble continuous wave signal.

1.8 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03r01, D05v02r05, D05Av01r02, D06v02r01 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 648474 D01v06r03 (Phablet Procedures)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)
- May 2017 TCB Workshop Notes (LTE 4x4 Downlink MIMO, LTE Band 41 Power Class 2/3)
- November 2017, April 2018, October 2018 TCB Workshop Notes (LTE Carrier Aggregation)

1.9 Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units. The serial numbers used for each test are indicated alongside the results in Section 12.

1.10 Bibliography

Report Type	Report Serial Number
RF Exposure Compliance Summary Report	1M2309070100-16.A3L
RF Exposure Part 2 Test Report	TESA2310000593ES

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2 PART 0 SAR CHARACTERIZATION

2.1 SAR Characterization

2.1.1 ECI and SAR Determination

This device uses different Exposure Condition Index (ECI) to configure different time averaged power levels based on certain exposure scenarios. Depending on the detection scheme implemented in the smartphone, the worst-case SAR was determined by measurements for the relevant exposure conditions for that ECI. Detailed descriptions of the detection mechanisms are included in the operational description.

When 1g SAR and 10g SAR exposure comparison is needed, the worst-case was determined from SAR normalized to 1g or 10g SAR limit.

The exposure condition index (ECI) conditions used in Table 2-1 and Table 2-2 represent different exposure scenarios.

**Table 2-1
ECI and Corresponding Exposure Scenarios WWAN**

Scenario	Description	SAR Test Cases
Head (ECI = 1)	<ul style="list-style-type: none"> ▪ Device positioned next to head ▪ Receiver Active 	Head SAR per KDB Publication 648474 D04
Hotspot mode (ECI = 2)	<ul style="list-style-type: none"> ▪ Device transmits in hotspot mode near body ▪ Hotspot Mode Active 	Hotspot SAR per KDB Publication 941225 D06
Phablet (ECI = 4)	<ul style="list-style-type: none"> ▪ Device is held with hand 	Phablet SAR per KDB Publication 648474 D04 & KDB Publication 616217 D04
Body-worn (ECI = 4)	<ul style="list-style-type: none"> ▪ Device being used with a body-worn accessory 	Body-worn SAR per KDB Publication 648474 D04

**Table 2-2
ECI and Corresponding Exposure Scenarios WLAN**

Scenario	Description	SAR Test Cases
Head (ECI = 1)	<ul style="list-style-type: none"> ▪ Device positioned next to head ▪ Receiver Active 	Head SAR per KDB Publication 648474 D04
Hotspot mode (ECI = 0)	<ul style="list-style-type: none"> ▪ Device transmits in hotspot mode near body ▪ Hotspot Mode Active 	Hotspot SAR per KDB Publication 941225 D06
Phablet (ECI = 0)	<ul style="list-style-type: none"> ▪ Device is held with hand 	Phablet SAR per KDB Publication 648474 D04 & KDB Publication 616217 D04
Body-worn (ECI = 0)	<ul style="list-style-type: none"> ▪ Device being used with a body-worn accessory 	Body-worn SAR per KDB Publication 648474 D04

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2.1.2 SAR_Design_Target

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 (see Table 2-3).

Table 2-3
SAR_design_target Calculations

SAR_design_target			
$SAR_design_target < SAR_regulatory_limit \times 10^{\frac{-Total\ Uncertainty}{10}}$			
1g SAR (W/kg)		10g SAR (W/kg)	
<i>Total Uncertainty</i>	1.0 dB	<i>Total Uncertainty</i>	1.0 dB
<i>SAR_regulatory_limit</i>	1.6 W/kg	<i>SAR_regulatory_limit</i>	4.0 W/kg
<i>WWAN SAR_design_target</i>	0.65 W/kg	<i>WWAN SAR_design_target</i>	1.625 W/kg
<i>WLAN SAR_design_target</i>	0.55 W/kg	<i>WLAN SAR_design_target</i>	1.375 W/kg

2.1.3 SAR Char

SAR test results corresponding to *Pmax/Plimit* for each antenna/technology/band/ECI can be found in SAR Summary Section and Part 0 SAR Test Results for *Plimit* Calculations Appendix.

Plimit is calculated by linearly scaling with the measured SAR at the Ppart0 to correspond to the *SAR_design_target*. When *Plimit* < *Pmax*, *Ppart0* was used as *Plimit* in the TAS . When *Plimit* > *Pmax* and *Ppart0*=*Pmax*, calculated *Plimit* was used in the TAS . All reported SAR obtained from the Ppart0 SAR tests was less than *SAR_Design_target*+ 1 dB Uncertainty. The final *Plimit* determination for each exposure scenario corresponding to *SAR_design_target* are shown in Table 2-4 and Table 2-5.

Table 2-4
PLimit Determination WWAN

Exposure Condition Index (ECI)	PLimit Determination Scenarios
4 or 3	The worst-case SAR exposure is determined as maximum SAR normalized to the limit (i.e. lowest <i>Plimit</i>) among: 1. Body Worn SAR 2. Extremity SAR measured at 0 mm for all surfaces.
1	<i>Plimit</i> is calculated based on 1g Head SAR
2	<i>Plimit</i> is calculated based on 1g Hotspot SAR at 10 mm

Table 2-5
PLimit Determination WLAN

Exposure Condition Index (ECI)	PLimit Determination Scenarios
0	The worst-case SAR exposure is determined as maximum SAR normalized to the limit (i.e. lowest <i>Plimit</i>) among: 1. Body Worn SAR 2. Extremity SAR measured at 0 mm for all surfaces. 3. Hotspot SAR at 10 mm
1	<i>Plimit</i> is calculated based on 1g Head SAR

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**Table 2-6
SAR Characterizations**

Exposure Scenario		Maximum Tune-Up Output Power*	Body-Worn or Phablet	Head	Hotspot	Earjack
Averaging Volume			1g/10g	1g	1g	1g/10g
Spacing			10mm, 0mm	0mm	10mm	10mm, 0mm
Configuration						
ECI			4	1	2	3
Technology/Band	Antenna	Pmax				
GSM 850	A	23.6	24.3	28.0	24.3	24.3
GSM 1900	B	20.8	21.6	30.0	21.6	21.6
UMTS 850	A	24.5	23.0	23.0	23.0	23.0
UMTS 1750	B	24.0	20.0	22.5	20.0	20.0
UMTS 1900	B	24.0	20.0	22.0	20.0	20.0
LTE Band 71	A	24.5	27.0	31.4	27.0	27.0
LTE Band 12	A	24.5	26.3	30.1	26.3	26.3
LTE Band 13	A	23.5	20.5	28.7	20.5	20.5
LTE Band 14	A	23.5	20.5	29.5	20.5	20.5
LTE Band 26/5	A	24.5	23.5	28.9	23.5	23.5
LTE Band 66/4	B	24.5	19.5	30.0	19.5	19.5
LTE Band 66/4	C	24.5	20.0	21.5	20.0	20.0
LTE Band 25/2	B	24.5	19.5	29.6	19.5	19.5
LTE Band 25/2	C	24.5	20.0	21.5	20.0	20.0
LTE Band 30	B	23.0	19.0	30.3	19.0	19.0
LTE Band 7	B	23.0	19.0	26.4	19.0	19.0
LTE Band 41 PC3	B	22.0	21.0	20.4	21.0	21.0
LTE Band 41 PC2	B	21.9	21.0	20.4	21.0	21.0
LTE Band 38	B	21.0	21.0	26.8	21.0	21.0
LTE Band 48	F	21.0	22.4	17.0	22.4	22.4
NR Band n71	A	24.5	27.0	30.6	27.0	27.0
NR Band n5	A	24.5	23.5	28.1	23.5	23.5
NR Band n70	B	24.5	22.0	29.1	22.0	22.0
NR Band n66	B	24.5	19.5	30.2	19.5	19.5
NR Band n66	C	24.5	20.0	21.5	20.0	20.0
NR Band n25/n2	B	24.5	19.5	30.2	19.5	19.5
NR Band n2	C	24.5	20.0	21.5	20.0	20.0
NR Band n41 PC3	B	23.0	17.0	18.0	17.0	17.0
NR Band n41 PC2	B	26.0	17.0	18.0	17.0	17.0
NR Band n48	F	23.0	17.0	13.0	17.0	17.0
NR Band n48	E	14.0	21.2	11.0	21.2	21.2
NR Band n48	H	11.5	25.7	8.5	25.7	25.7
NR Band n48	G	12.0	21.2	9.0	21.2	21.2
NR Band n78 PC3	F	23.0	16.0	15.0	16.0	16.0
NR Band n78 PC3	E	14.0	13.0	12.0	13.0	13.0
NR Band n78 PC3	H	11.0	9.0	8.0	9.0	9.0
NR Band n78 PC3	G	12.0	10.5	9.5	10.5	10.5
NR Band n78 PC2	F	26.0	16.0	15.0	16.0	16.0
NR Band n78 PC2	E	14.0	13.0	12.0	13.0	13.0
NR Band n78 PC2	H	11.0	9.0	8.0	9.0	9.0
NR Band n78 PC2	G	12.0	10.5	9.5	10.5	10.5
NR Band n77 PC3	F	23.0	16.0	15.0	16.0	16.0
NR Band n77 PC3	E	14.0	13.0	12.0	13.0	13.0
NR Band n77 PC3	H	11.5	9.0	8.0	9.0	9.0
NR Band n77 PC3	G	12.0	10.5	9.5	10.5	10.5
NR Band n77 PC2	F	26.0	16.0	15.0	16.0	16.0
NR Band n77 PC2	E	14.0	13.0	12.0	13.0	13.0
NR Band n77 PC2	H	11.5	9.0	8.0	9.0	9.0
NR Band n77 PC2	G	12.0	10.5	9.5	10.5	10.5

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Exposure Scenario		Maximum Tune-Up Output Power*	Body-Worn or Phablet or Hotspot or Earjack	Head
Averaging Volume			1g/10g	1g
Spacing			10mm, 0mm	0mm
ECI			0	1
Technology/Band	Antenna	Pmax		
2.4 GHz WIFI	E	20.0	20.3	13.0
5 GHz WIFI	E	19.0	14.0	12.0

Notes:

- When $P_{max} < P_{limit}$, the DUT will operate at a power level up to P_{max}
- All P_{limit} and maximum tune up output power P_{max} levels entered in above Table correspond to average power levels after accounting for duty cycle in the case of TDD, GMSK, or OFDM modulation schemes (e.g. GSM, LTE TDD and WLAN).
- Maximum tune up output power P_{max} is used to configure EUT during RF tune up procedure. The maximum allowed output power is equal to maximum Tune up output power + 1dB device design uncertainty.

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LTE Information					
Form Factor	Portable Handset				
Frequency Range of each LTE transmission band	LTE Band 71: 665.5 - 695.5 MHz				
	LTE Band 12: 699.7 - 715.3 MHz				
	LTE Band 13: 779.5 - 784.5 MHz				
	LTE Band 14: 780.5 - 795.5 MHz				
	LTE Band 28: 814.7 - 848.3 MHz				
	LTE Band 9: 824.7 - 848.3 MHz				
	LTE Band 66: 1710.7 - 1779.3 MHz				
	LTE Band 4: 1710.7 - 1754.3 MHz				
	LTE Band 25: 1850.7 - 1914.3 MHz				
	LTE Band 2: 1850.7 - 1909.3 MHz				
	LTE Band 30: 2307.5 - 2312.5 MHz				
	LTE Band 7: 2502.5 - 2567.5 MHz				
	LTE Band 41: 2506 - 2680 MHz				
	LTE Band 38: 2572.5 - 2617.5 MHz				
	LTE Band 48: 3552.5 - 3697.5 MHz				
	Channel Bandwidths	LTE Band 71: 5 MHz, 10 MHz, 15 MHz, 20 MHz			
		LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz			
		LTE Band 13: 5 MHz, 10 MHz			
		LTE Band 14: 5 MHz, 10 MHz			
		LTE Band 28: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz			
LTE Band 5: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz					
LTE Band 66: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz					
LTE Band 4: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz					
LTE Band 25: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz					
LTE Band 2: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz					
LTE Band 30: 5 MHz, 10 MHz					
LTE Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz					
LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz					
LTE Band 38: 5 MHz, 10 MHz, 15 MHz, 20 MHz					
LTE Band 48: 5 MHz, 10 MHz, 15 MHz, 20 MHz					
Channel Numbers and Frequencies (MHz)		Low	Low-Mid	Mid-High	High
LTE Band 71: 5 MHz		665.5 (133147)	660.5 (133297)	(N/A)	695.5 (133447)
LTE Band 71: 10 MHz		668 (133172)	660.5 (133297)	(N/A)	693 (133422)
LTE Band 71: 15 MHz		670.5 (133197)	660.5 (133297)	(N/A)	690.5 (133397)
LTE Band 71: 20 MHz	673 (133222)	660.5 (133297)	(N/A)	688 (133372)	
LTE Band 12: 1.4 MHz	699.7 (23017)	707.5 (23095)		715.3 (23173)	
LTE Band 12: 3 MHz	700.5 (23025)	707.5 (23095)		714.5 (23165)	
LTE Band 12: 5 MHz	701.5 (23035)	707.5 (23095)		713.5 (23155)	
LTE Band 12: 10 MHz	704 (23060)	707.5 (23095)		711 (23130)	
LTE Band 13: 5 MHz	779.5 (23205)	782 (23230)		784.5 (23255)	
LTE Band 13: 10 MHz	(N/A)	782 (23230)		(N/A)	
LTE Band 14: 5 MHz	790.5 (23305)	789 (23330)		795.5 (23355)	
LTE Band 14: 10 MHz	(N/A)	793 (23330)		(N/A)	
LTE Band 28: 1.4 MHz	814.7 (26897)	831.5 (26865)		848.3 (27033)	
LTE Band 28: 3 MHz	815.5 (26705)	831.5 (26865)		847.5 (27025)	
LTE Band 28: 5 MHz	816.5 (26715)	831.5 (26865)		846.5 (27015)	
LTE Band 28: 10 MHz	819 (26740)	831.5 (26865)		844 (26990)	
LTE Band 28: 15 MHz	821.5 (26765)	831.5 (26865)		841.5 (26965)	
LTE Band 5: 1.4 MHz	824.7 (20487)	836.5 (20525)		848.3 (20643)	
LTE Band 5: 3 MHz	825.5 (20415)	836.5 (20525)		847.5 (20635)	
LTE Band 5: 5 MHz	826.5 (20425)	836.5 (20525)		846.5 (20625)	
LTE Band 5: 10 MHz	829 (20450)	836.5 (20525)		844 (20600)	
LTE Band 66: 1.4 MHz	1710.7 (131979)	1745 (132322)		1779.3 (132665)	
LTE Band 66: 3 MHz	1711.5 (131987)	1745 (132322)		1778.5 (132657)	
LTE Band 66: 5 MHz	1712.5 (131997)	1745 (132322)		1777.5 (132647)	
LTE Band 66: 10 MHz	1715 (132022)	1745 (132322)		1775 (132622)	
LTE Band 66: 15 MHz	1717.5 (132047)	1745 (132322)		1772.5 (132597)	
LTE Band 66: 20 MHz	1720 (132072)	1745 (132322)		1770 (132572)	
LTE Band 4: 1.4 MHz	1710.7 (19857)	1732.5 (20175)		1754.3 (20393)	
LTE Band 4: 3 MHz	1711.5 (19865)	1732.5 (20175)		1753.5 (20385)	
LTE Band 4: 5 MHz	1712.5 (19875)	1732.5 (20175)		1752.5 (20375)	
LTE Band 4: 10 MHz	1715 (20000)	1732.5 (20175)		1750 (20250)	
LTE Band 4: 15 MHz	1717.5 (20025)	1732.5 (20175)		1747.5 (20225)	
LTE Band 4: 20 MHz	1720 (20050)	1732.5 (20175)		1745 (20200)	
LTE Band 25: 1.4 MHz	1860.7 (26047)	1882.5 (26365)		1914.3 (26683)	
LTE Band 25: 3 MHz	1851.5 (26055)	1882.5 (26365)		1913.5 (26675)	
LTE Band 25: 5 MHz	1852.5 (26065)	1882.5 (26365)		1912.5 (26665)	
LTE Band 25: 10 MHz	1855 (26090)	1882.5 (26365)		1910 (26640)	
LTE Band 25: 15 MHz	1857.5 (26115)	1882.5 (26365)		1907.5 (26615)	
LTE Band 25: 20 MHz	1860 (26140)	1882.5 (26365)		1905 (26590)	
LTE Band 2: 1.4 MHz	1860.7 (18607)	1880 (18900)		1908.3 (19193)	
LTE Band 2: 3 MHz	1851.5 (18615)	1880 (18900)		1908.5 (19185)	
LTE Band 2: 5 MHz	1852.5 (18625)	1880 (18900)		1907.5 (19175)	
LTE Band 2: 10 MHz	1855 (18650)	1880 (18900)		1905 (19150)	
LTE Band 2: 15 MHz	1857.5 (18675)	1880 (18900)		1902.5 (19125)	
LTE Band 2: 20 MHz	1860 (18700)	1880 (18900)		1900 (19100)	
LTE Band 30: 5 MHz	2307.5 (27685)	2310 (27710)		2312.5 (27735)	
LTE Band 30: 10 MHz	(N/A)	2310 (27710)		(N/A)	
LTE Band 7: 5 MHz	2502.5 (20779)	2535 (21100)		2567.5 (21425)	
LTE Band 7: 10 MHz	2505 (20800)	2535 (21100)		2565 (21400)	
LTE Band 7: 15 MHz	2507.5 (20825)	2535 (21100)		2562.5 (21375)	
LTE Band 7: 20 MHz	2510 (20850)	2535 (21100)		2560 (21350)	
LTE Band 41: 5 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	
LTE Band 38: 5 MHz	2572.5 (37775)	2595 (38000)		2617.5 (38225)	
LTE Band 38: 10 MHz	2575 (37800)	2595 (38000)		2615 (38200)	
LTE Band 38: 15 MHz	2577.5 (37825)	2595 (38000)		2612.5 (38175)	
LTE Band 38: 20 MHz	2580 (37850)	2595 (38000)		2610 (38150)	
LTE Band 48: 5 MHz	3552.5 (55285)	3600.5 (55748)	(N/A)	3648.2 (56232)	
LTE Band 48: 10 MHz	3555 (55290)	3601.7 (55757)	(N/A)	3648.3 (56233)	
LTE Band 48: 15 MHz	3557.5 (55315)	3602.5 (55765)	(N/A)	3647.5 (56215)	
LTE Band 48: 20 MHz	3560 (55340)	3603.3 (55773)	(N/A)	3646.7 (56207)	
UE Category	DL UE Cat 13, UL UE Cat 16				
Modulations Supported in UL	QPSK, 16 QAM, 64 QAM, 256 QAM				
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.2-4.2.5? (manufacturer attestation to be provided)	YES				
A-MPR (Additional MPR) disabled for SAR Testing?	YES				
LTE Carrier Aggregation Possible Combinations	The technical description includes all the possible carrier aggregation combinations				
LTE Additional Information	This device does not support full CA features on 3GPP Release 15. It supports carrier aggregation, downlink MIMO features as shown in the RF Conducted Powers section of this report and the Downlink LTE CA RF Conducted Powers Appendix. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. The following LTE Release 15 Features are not supported: Relay, HetNet, Enhanced MIMO, eICIC, eMBMS, Wi-Fi Offloading, Cross-Carrier Scheduling, Enhanced SC-FDMA.				

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4 INTRODUCTION

The FCC and Innovation, Science, and Economic Development Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [22]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

4.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 4-1).

Equation 4-1
SAR Mathematical Equation

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

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

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

where:

- σ = conductivity of the tissue-simulating material (S/m)
- ρ = mass density of the tissue-simulating material (kg/m³)
- E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

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5 DOSIMETRIC ASSESSMENT

5.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 5-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 5-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
 - a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 5-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
 - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
 - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

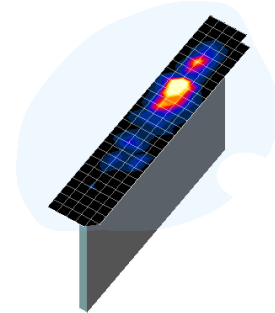


Figure 5-1
Sample SAR Area Scan

Table 5-1
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04*

Frequency	Maximum Area Scan Resolution (mm) ($\Delta x_{\text{area}}, \Delta y_{\text{area}}$)	Maximum Zoom Scan Resolution (mm) ($\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}}$)	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x, y, z)
			Uniform Grid	Graded Grid		
			$\Delta z_{\text{zoom}}(n)$	$\Delta z_{\text{zoom}}(1)^*$	$\Delta z_{\text{zoom}}(n>1)^*$	
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≤ 4	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 22

*Also compliant to IEEE 1528-2013 Table 6

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6 DEFINITION OF REFERENCE POINTS

6.1 EAR REFERENCE POINT

Figure 6-2 shows the front, back and side views of the SAM Twin Phantom. The point “M” is the reference point for the center of the mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERP is 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 6-1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front), also called the Reference Pivoting Line, is not perpendicular to the reference plane (see Figure 6-1). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].

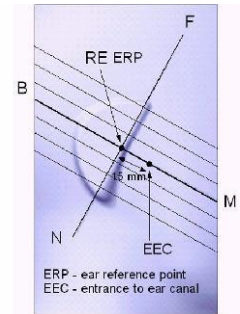


Figure 6-1
Close-Up Side view of ERP

6.2 HANDSET REFERENCE POINTS

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the acoustic output located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (See Figure 6-3). The acoustic output was then located at the same level as the center of the ear reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at its top and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.



Figure 6-2
Front, back and side view of SAM Twin Phantom

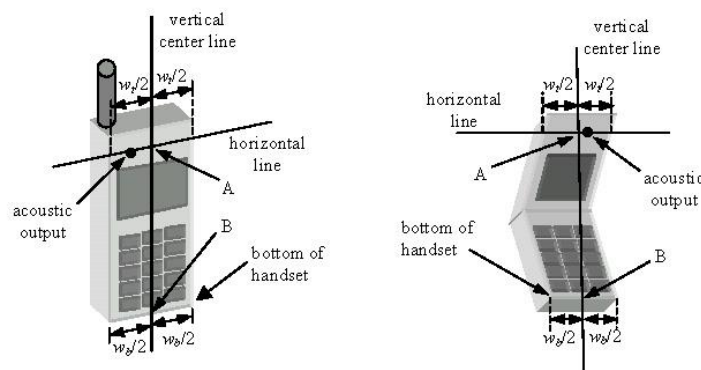


Figure 6-3
Handset Vertical Center & Horizontal Line Reference Points

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7 TEST CONFIGURATION POSITIONS

7.1 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon = 3$ and loss tangent $\delta = 0.02$.

7.2 Positioning for Cheek

1. The test device was positioned with the device close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 7-1), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

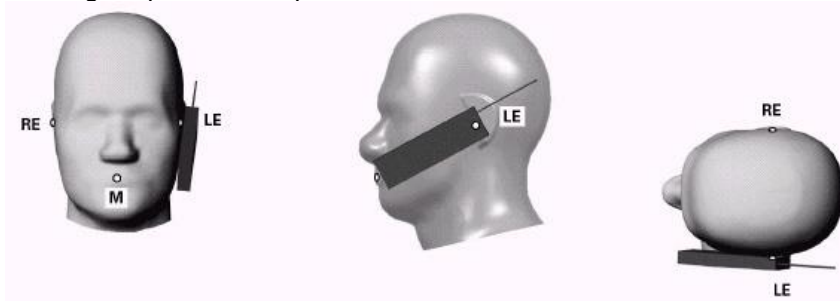


Figure 7-1 Front, Side and Top View of Cheek Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the pinna.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the reference plane.
4. The phone was then rotated around the vertical centerline until the phone (horizontal line) was symmetrical with respect to the line NF.
5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the device contact with the ear, the device was rotated about the NF line until any point on the handset made contact with a phantom point below the ear (cheek) (See Figure 7-2).

7.3 Positioning for Ear / 15° Tilt

With the test device aligned in the “Cheek Position”:

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degrees.
2. The phone was then rotated around the horizontal line by 15 degrees.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the handset touched the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. In this situation, the tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 7-2).

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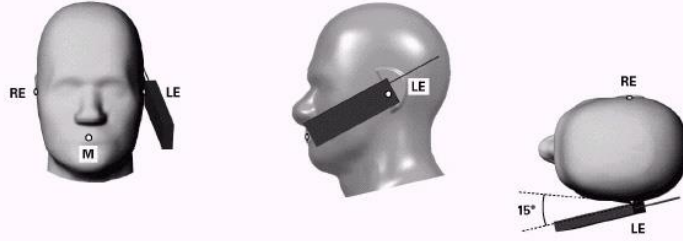


Figure 7-2 Front, Side and Top View of Ear/15° Tilt Position

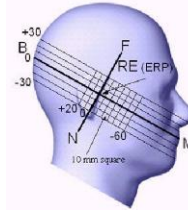


Figure 7-3 Side view w/ relevant markings

7.4 SAR Evaluations near the Mouth/Jaw Regions of the SAM Phantom

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones. Per IEEE 1528-2013, a rotated SAM phantom is necessary to allow probe access to such regions. Both SAM heads of the TwinSAM-Chin20 are rotated 20 degrees around the NF line. Each head can be removed from the table for emptying and cleaning.

Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document FCC KDB Publication 648474 D01v06r03. The SAR required in these regions of SAM should be measured using a flat phantom. The phone should be positioned with a separation distance of 4 mm between the ear reference point (ERP) and the outer surface of the flat phantom shell. While maintaining this distance at the ERP location, the low (bottom) edge of the phone should be lowered from the phantom to establish the same separation distance between the peak SAR location identified by the truncated partial SAR distribution measured with the SAM phantom. The distance from the peak SAR location to the phone is determined by the straight line passing perpendicularly through the phantom surface. When it is not feasible to maintain 4 mm separation at the ERP while also establishing the required separation at the peak SAR location, the top edge of the phone will be allowed to touch the phantom with a separation < 4 mm at the ERP. The phone should not be tilted to the left or right while placed in this inclined position to the flat phantom.

7.5 Body-Worn Accessory 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 (see Figure 7-4). Per FCC KDB Publication 648474 D01v06r03, 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 D01v06 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.

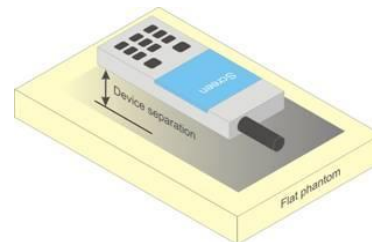


Figure 7-4 Sample Body-Worn Diagram

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

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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.

7.6 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user’s body, SAR compliance for the body is also required. The 1g body and 10g extremity SAR Exclusion Thresholds found in KDB Publication 447498 D01v06 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v06, Cell phones (handsets) are not normally designed to be used on extremities or operated in extremity only exposure conditions. The maximum output power levels of handsets generally do not require extremity SAR testing to show compliance. Therefore, extremity SAR was not evaluated for this device.

7.7 Wireless Router Configurations

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 D06v02r01 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. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 procedures. The “Portable Hotspot” feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

7.8 Phablet Configurations

For smart phones with a display diagonal dimension > 150 mm or an overall diagonal dimension > 160 mm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that

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support voice calls next to the ear, the phablets procedures outlined in KDB Publication 648474 D01v06r03 should be applied to evaluate SAR compliance. A device marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance. In addition to the normally required head and body-worn accessory SAR test procedures required for handsets, the UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna ≤ 25 mm from that surface or edge, in direct contact with the phantom, for 10g SAR. The UMPC mini-tablet 1g SAR at 5 mm is not required. When hotspot mode applies, 10g SAR is required only for the surfaces and edges with hotspot mode 1g SAR > 1.2 W/kg.

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8 RF EXPOSURE LIMITS

8.1 Uncontrolled Environment

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

8.2 Controlled Environment

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

**Table 8-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6**

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT <i>General Population (W/kg) or (mW/g)</i>	CONTROLLED ENVIRONMENT <i>Occupational (W/kg) or (mW/g)</i>
Peak Spatial Average SAR Head	1.6	8.0
Whole Body SAR	0.08	0.4
Peak Spatial Average SAR Hands, Feet, Ankle, Wrists, etc.	4.0	20

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

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9 FCC MEASUREMENT PROCEDURES

Power measurements for licensed transmitters are performed using a base station simulator under digital average power.

9.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

9.2 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01v03r01, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tune-up tolerance specified for production units in a secondary mode is ≤ 0.25 dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is ≤ 1.2 W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.

9.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03r01 “3G SAR Measurement Procedures.”

The device is placed into a simulated call using a base station simulator in a RF shielded chamber. Establishing connections in this manner ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. Devices under test are evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device is tested throughout the SAR test at maximum output power, the SAR measurement system measures a “point SAR” at an arbitrary reference point at the start and end of the 1 gram SAR evaluation, to assess for any power drifts during the evaluation. If the power drift deviates by more than 5%, the SAR test and drift measurements are repeated.

9.4 SAR Measurement Conditions for UMTS

9.4.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC with TPC (transmit power control) set to all “1s” or 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, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

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9.4.2 Head SAR Measurements

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.

9.4.3 Body SAR Measurements

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

9.4.4 SAR Measurements with Rel 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, for the highest reported SAR configuration in 12.2 kbps RMC without HSDPA. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

9.4.5 SAR Measurements with Rel 6 HSUPA

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

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

9.4.6 SAR Measurement Conditions for DC-HSDPA

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

9.5 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r04 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

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9.5.1 Spectrum Plots for RB Configurations

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

9.5.2 MPR

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

9.5.3 A-MPR

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

9.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r04:

- a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
 - i. The required channel and offset combination with the highest maximum output power is required for SAR.
 - ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
 - iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.
- b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
- c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
- d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to $\frac{1}{2}$ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is < 1.45 W/kg.

9.5.5 TDD

LTE TDD testing is performed using the SAR test guidance provided in FCC KDB 941225 D05v02r04. TDD is tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225 D05v02r04. SAR testing is performed using the extended cyclic prefix listed in 3GPP TS 36.211 Section 4.

9.5.6 Downlink Only Carrier Aggregation

Conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink

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carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band. Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for downlink only carrier aggregation configurations when the average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive.

9.6 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v02r02 for more details.

9.6.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters.

A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

9.6.2 U-NII-1 and U-NII-2A

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, SAR measurement using OFDM SAR test procedures is not required for U-NII-1 unless the highest reported SAR for U-NII-2A is > 1.2 W/kg. When different maximum output powers are specified for the bands, SAR measurement for the U-NII band with the lower maximum output power is not required unless the highest reported SAR for the U-NII band with the higher maximum output power, adjusted by the ratio of lower to higher specified maximum output power for the two bands, is > 1.2 W/kg. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

9.6.3 U-NII-2C and U-NII-3

The frequency range covered by U-NII-2C and U-NII-3 is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification. Unless band gap channels are permanently disabled, SAR must be considered for these channels. Each band is tested independently according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

9.6.4 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all

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positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

9.6.5 2.4 GHz SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either the 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 position 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 802.11 g/n/ax OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

9.6.6 OFDM Transmission Mode and SAR Test Channel Selection

When the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel bandwidth, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. Per April 2019 TCB Workshop guidance, 802.11ax was considered the highest order 802.11 mode. When the maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

9.6.7 Initial Test Configuration Procedure

For OFDM, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order IEEE 802.11 mode. The channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest

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802.11 mode is considered for SAR measurements (See Section 9.6.6). When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

9.6.8 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg, no additional SAR tests for the subsequent test configurations are required. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

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10 RF CONDUCTED POWERS

10.1 GSM Conducted Powers

Table 10-1
Measured P_{max} for all ECI for GSM 850 and GSM 1900

Maximum Burst-Averaged Output Power										
Band	Channel	Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
		GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	32.76	32.73	29.63	27.98	26.80	26.27	23.25	22.02	20.73
	190	32.95	32.93	29.90	28.19	27.02	26.40	23.39	22.04	20.74
	251	32.98	32.96	29.94	28.20	27.07	26.55	23.51	22.18	20.90
GSM 1900	512	29.89	29.88	26.98	25.03	23.76	25.55	22.59	20.93	19.43
	661	30.03	30.02	27.14	25.18	23.94	25.65	22.74	21.04	19.54
	810	29.65	29.64	26.85	24.89	23.65	25.23	22.37	20.67	19.21
Calculated Maximum Frame-Averaged Output Power										
Band	Channel	Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
		GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	23.56	23.53	23.44	23.55	23.62	17.07	17.06	17.59	17.55
	190	23.75	23.73	23.71	23.76	23.84	17.20	17.20	17.61	17.56
	251	23.78	23.76	23.75	23.77	23.89	17.35	17.32	17.75	17.72
GSM 1900	512	20.69	20.68	20.79	20.60	20.58	16.35	16.40	16.50	16.25
	661	20.83	20.82	20.95	20.75	20.76	16.45	16.55	16.61	16.36
	810	20.45	20.44	20.66	20.46	20.47	16.03	16.18	16.24	16.03
GSM 850	Frame	23.30	23.30	23.31	23.57	23.32	17.30	17.31	17.57	17.32
GSM 1900	Avg.Targets:	20.30	20.30	20.81	20.57	20.82	16.30	16.31	16.57	16.82

Note:

- Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged power was calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.
- GPRS/EDGE (GMSK) output powers were measured with coding scheme setting of 1 (CS1) on the base station simulator. CS1 was configured to measure GPRS output power measurements and SAR to ensure GMSK modulation in the signal. Our Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels or modulation in the GPRS modes.
- EDGE (8-PSK) output powers were measured with MCS7 on the base station simulator. MCS7 coding scheme was used to measure the output powers for EDGE since investigation has shown that choosing MCS7 coding scheme will ensure 8-PSK modulation. It has been shown that MCS levels that produce 8-PSK modulation do not have an impact on output power.

GSM Class: B
GPRS Multislot class: 33 (Max 4 Tx uplink slots)
EDGE Multislot class: 33 (Max 4 Tx uplink slots)
DTM Multislot Class: N/A



Figure 10-1
Power Measurement Setup

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10.2 UMTS Conducted Powers

Table 10-2
Measured P_{limit} for all ECI for UMTS 850
Measured P_{limit} for ECI= 4 (Body-worn or Phablet) and/or ECI = 2 (Hotsopt) and/or ECI = 3 (Earjack)
for UMTS 1750 & UMTS 1900

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	1312	1412	1513	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	22.73	22.88	22.80	20.42	19.96	19.62	20.03	20.26	19.97	-
99		12.2 kbps AMR	22.78	22.86	22.75	20.45	19.97	19.65	20.11	20.34	19.91	-
6	HSDPA	Subtest 1	21.13	21.21	21.13	18.85	18.43	18.30	18.57	18.67	18.30	0
6		Subtest 2	21.18	21.25	21.14	18.89	18.44	18.31	18.59	18.71	18.30	0
6		Subtest 3	20.71	20.79	20.69	18.43	18.00	17.87	18.19	18.29	17.87	0.5
6		Subtest 4	20.69	20.76	20.65	18.41	17.97	17.83	18.15	18.27	17.85	0.5
6	HSUPA	Subtest 1	20.11	20.17	20.09	18.01	18.05	18.02	17.56	17.64	17.23	0
6		Subtest 2	19.61	19.70	19.57	17.38	16.95	16.82	16.86	16.99	16.76	2
6		Subtest 3	20.63	20.68	20.58	17.43	17.99	17.85	17.06	17.15	16.72	1
6		Subtest 4	19.12	19.15	19.06	16.91	16.47	16.30	16.55	16.66	16.25	2
6		Subtest 5	21.62	21.64	21.61	19.43	19.40	19.40	18.04	18.13	18.14	0
8	DC-HSDPA	Subtest 1	21.11	21.18	21.10	18.91	18.49	18.37	18.56	18.65	18.28	0
8		Subtest 2	21.13	21.18	21.10	18.93	18.50	18.38	18.56	18.66	18.25	0
8		Subtest 3	20.63	20.67	20.58	18.40	17.96	17.86	18.09	18.17	17.75	0.5
8		Subtest 4	20.60	20.65	20.55	18.41	17.98	17.85	18.10	18.17	17.77	0.5

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Table 10-3
Measured P_{limit} for ECI = 1 (Head) for UMTS 1750 & UMTS 1900

3GPP Release Version	Mode	3GPP 34.121 Subtest	AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			1312	1412	1513	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	23.35	22.90	22.60	22.20	22.47	22.13	-
99		12.2 kbps AMR	23.34	22.89	22.55	22.12	22.45	22.10	-
6	HSDPA	Subtest 1	21.39	20.90	20.58	20.77	21.03	20.63	0
6		Subtest 2	21.45	20.96	20.61	20.63	21.06	20.65	0
6		Subtest 3	21.02	20.51	20.18	20.37	20.62	20.20	0.5
6		Subtest 4	20.97	20.49	20.16	20.34	20.58	20.15	0.5
6	HSUPA	Subtest 1	20.35	19.77	19.27	19.13	19.37	19.14	0
6		Subtest 2	19.88	19.26	18.79	19.26	19.47	19.05	2
6		Subtest 3	19.89	19.40	19.04	19.25	19.48	19.11	1
6		Subtest 4	19.40	18.94	18.56	18.75	19.01	18.60	2
6		Subtest 5	20.88	20.27	19.79	20.25	20.52	20.09	0
8	DC-HSDPA	Subtest 1	21.34	20.92	20.60	20.78	21.03	21.06	0
8		Subtest 2	21.38	20.93	20.61	20.81	21.04	20.63	0
8		Subtest 3	20.87	20.39	20.07	20.32	20.55	20.12	0.5
8		Subtest 4	20.92	20.41	20.10	20.29	20.53	20.09	0.5

DC-HSDPA considerations

- 3GPP Specification 34.121-1 Release 8 Ver 8.10.0 was used for DC-HSDPA guidance
- H-Set 12 (QPSK) was confirmed to be used during DC-HSDPA measurements
- The DUT supports UE category 24 for HSDPA

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



Figure 10-2
Power Measurement Setup

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10.3 LTE Conducted Powers

Note: Per FCC KDB Publication 941225 D05v02r05, LTE SAR for the lower bandwidths was not required for testing since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg. Lower bandwidth conducted powers for all LTE bands can be found in LTE and NR Lower Bandwidth RF Conducted Powers Appendix.

Note: Some bands do not support three non-overlapping channels. Per KDB Publication 941225 D05v02, 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.

LTE Carrier Aggregation Notes:

1. This device supports uplink carrier aggregation for LTE CA_48C, and LTE CA_41C with a maximum of two component carriers. For intraband contiguous carrier aggregation scenarios, 3GPP 36.101 Table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when non-contiguous RB allocation is implemented. The conducted powers and MPR settings in this device are permanently implemented per the above 3GPP requirements.
2. Per FCC Guidance, the output power with uplink CA active was measured for the configuration with the highest reported SAR with single carrier for each exposure condition. The power was measured with wideband signal integration over both component carriers.

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10.3.1 LTE Band 71 Antenna A

Table 10-4
LTE Band 71 Antenna A Measured P_{Max} for all ECI - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			133297 (680.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	24.04	0	0
	1	50	24.15		0
	1	99	24.21		0
	50	0	23.01	0-1	1
	50	25	23.08		1
	50	50	23.09		1
	100	0	23.07		1
16QAM	1	0	23.35	0-1	1
	1	50	23.41		1
	1	99	23.46		1
	50	0	22.00	0-2	2
	50	25	22.10		2
	50	50	22.16		2
	100	0	22.09		2
64QAM	1	0	21.70	0-2	2
	1	50	21.90		2
	1	99	21.99		2
	50	0	21.03	0-3	3
	50	25	21.15		3
	50	50	21.17		3
	100	0	21.13		3
256QAM	1	0	19.15	0-5	5
	1	50	19.33		5
	1	99	19.46		5
	50	0	18.97		5
	50	25	19.08		5
	50	50	19.15		5
	100	0	19.04		5

Note: LTE Band 71 at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, 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.

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10.3.2 LTE Band 12 Antenna A

Table 10-5
LTE Band 12 Antenna A Measured P_{Max} for all ECI - 10 MHz Bandwidth

LTE Band 12 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23095 (707.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	24.47	0	0
	1	25	24.52		0
	1	49	24.57		0
	25	0	23.56	0-1	1
	25	12	23.57		1
	25	25	23.55		1
	50	0	23.56		1
16QAM	1	0	24.16	0-1	1
	1	25	24.14		1
	1	49	24.18		1
	25	0	22.60	0-2	2
	25	12	22.64		2
	25	25	22.63		2
	50	0	22.53		2
64QAM	1	0	22.46	0-2	2
	1	25	22.49		2
	1	49	22.50		2
	25	0	21.69	0-3	3
	25	12	21.73		3
	25	25	21.72		3
	50	0	21.67		3
256QAM	1	0	20.18	0-5	5
	1	25	20.21		5
	1	49	20.23		5
	25	0	19.72		5
	25	12	19.73		5
	25	25	19.71		5
	50	0	19.68		5

Note: LTE Band 12 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, 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.

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10.3.3 LTE Band 13 Antenna A

Table 10-6
LTE Band 13 Antenna A Measured P_{Max} and/or P_{limit} ECI = 1 (head) - 10 MHz Bandwidth

LTE Band 13 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23230 (782.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.22	0	0
	1	25	23.34		0
	1	49	23.48		0
	25	0	22.31	0-1	1
	25	12	22.38		1
	25	25	22.48		1
	50	0	22.42		1
16QAM	1	0	22.78	0-1	1
	1	25	23.02		1
	1	49	23.10		1
	25	0	21.47	0-2	2
	25	12	21.53		2
	25	25	21.59		2
	50	0	21.46		2
64QAM	1	0	21.31	0-2	2
	1	25	21.43		2
	1	49	21.49		2
	25	0	20.45	0-3	3
	25	12	20.50		3
	25	25	20.57		3
	50	0	20.49		3
256QAM	1	0	19.00	0-5	5
	1	25	19.07		5
	1	49	19.15		5
	25	0	18.47		5
	25	12	18.51		5
	25	25	18.57		5
	50	0	18.50		5

Note: LTE Band 13 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, 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.

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Table 10-7
LTE Band 13 Antenna A Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) - 10 MHz Bandwidth

LTE Band 13 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23230 (782.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	20.03	0	0
	1	25	20.18		0
	1	49	20.25		0
	25	0	20.41	0-1	0
	25	12	20.10		0
	25	25	20.20		0
	50	0	20.10		0
16QAM	1	0	20.53	0-1	0
	1	25	20.36		0
	1	49	20.38		0
	25	0	20.34	0-2	0
	25	12	20.12		0
	25	25	20.20		0
	50	0	20.37		0
64QAM	1	0	20.40	0-2	0
	1	25	20.48		0
	1	49	20.53		0
	25	0	20.07	0-3	0
	25	12	20.15		0
	25	25	20.23		0
	50	0	20.06		0
256QAM	1	0	18.17	0-5	2
	1	25	18.35		2
	1	49	18.40		2
	25	0	18.06		2
	25	12	18.11		2
	25	25	18.22		2
	50	0	18.06		2

Note: LTE Band 13 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, 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.

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10.3.4 LTE Band 14 Antenna A

Table 10-8
LTE Band 14 Antenna A Measured P_{Max} and/or P_{limit} ECI = 1 (head) - 10 MHz Bandwidth

LTE Band 14 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23330 (793.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.53	0	0
	1	25	23.45		0
	1	49	23.40		0
	25	0	22.59	0-1	1
	25	12	22.50		1
	25	25	22.50		1
	50	0	22.53		1
16QAM	1	0	23.16	0-1	1
	1	25	23.10		1
	1	49	23.03		1
	25	0	21.65	0-2	2
	25	12	21.53		2
	25	25	21.54		2
	50	0	21.49		2
64QAM	1	0	21.50	0-2	2
	1	25	21.47		2
	1	49	21.34		2
	25	0	20.69	0-3	3
	25	12	20.64		3
	25	25	20.60		3
	50	0	20.60		3
256QAM	1	0	19.17	0-5	5
	1	25	19.16		5
	1	49	19.10		5
	25	0	18.70		5
	25	12	18.65		5
	25	25	18.60		5
	50	0	18.59		5

Note: LTE Band 14 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, 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.

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Table 10-9
LTE Band 14 Antenna A Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) - 10 MHz Bandwidth

LTE Band 14 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23330 (793.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	20.22	0	0
	1	25	20.23		0
	1	49	20.21		0
	25	0	20.23	0-1	0
	25	12	20.19		0
	25	25	20.20		0
	50	0	20.21		0
16QAM	1	0	20.99	0-1	0
	1	25	21.04		0
	1	49	20.96		0
	25	0	20.24	0-2	0
	25	12	20.21		0
	25	25	20.20		0
	50	0	20.21		0
64QAM	1	0	20.60	0-2	0
	1	25	20.61		0
	1	49	20.61		0
	25	0	20.23	0-3	0
	25	12	20.21		0
	25	25	20.21		0
	50	0	20.24		0
256QAM	1	0	18.47	0-5	2
	1	25	18.48		2
	1	49	18.44		2
	25	0	18.33		2
	25	12	18.30		2
	25	25	18.29		2
	50	0	18.25		2

Note: LTE Band 14 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, 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.

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10.3.5 LTE Band 26 (Cell) Antenna A

Table 10-10

LTE Band 26 (Cell) Antenna A Measured P_{Max} and/or P_{limit} ECI = 1 (head) - 15 MHz Bandwidth

LTE Band 26 (Cell) 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26865 (831.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	24.35	0	0
	1	36	24.54		0
	1	74	24.42		0
	36	0	23.47	0-1	1
	36	18	23.51		1
	36	37	23.53		1
	75	0	23.50		1
16QAM	1	0	23.97	0-1	1
	1	36	23.98		1
	1	74	23.99		1
	36	0	22.44	0-2	2
	36	18	22.49		2
	36	37	22.53		2
	75	0	22.54		2
64QAM	1	0	22.30	0-2	2
	1	36	22.43		2
	1	74	22.41		2
	36	0	21.51	0-3	3
	36	18	21.55		3
	36	37	21.58		3
	75	0	21.49		3
256QAM	1	0	19.95	0-5	5
	1	36	19.97		5
	1	74	19.94		5
	36	0	19.53		5
	36	18	19.62		5
	36	37	19.57		5
	75	0	19.59		5

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Table 10-11
LTE Band 26 (Cell) Antenna A Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) - 15 MHz Bandwidth

LTE Band 26 (Cell) 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26865 (831.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.24	0	0
	1	36	23.48		0
	1	74	23.52		0
	36	0	23.49	0-1	0
	36	18	23.51		0
	36	37	23.53		0
	75	0	23.49		0
16QAM	1	0	23.76	0-1	0
	1	36	23.86		0
	1	74	23.82		0
	36	0	22.48	0-2	1
	36	18	22.44		1
	36	37	22.50		1
	75	0	22.49		1
64QAM	1	0	22.74	0-2	1
	1	36	22.67		1
	1	74	22.73		1
	36	0	21.57	0-3	2
	36	18	21.58		2
	36	37	21.56		2
	75	0	21.56		2
256QAM	1	0	19.65	0-5	4
	1	36	19.69		4
	1	74	19.56		4
	36	0	19.54		4
	36	18	19.52		4
	36	37	19.56		4
	75	0	19.56		4

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10.3.6 LTE Band 66 Antenna B

Table 10-12

LTE Band 66 (AWS) Antenna B Measured P_{Max} and/or P_{limit} ECI = 1 (head) – 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132072 (1720.0 MHz)	132322 (1745.0 MHz)	132572 (1770.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	25.22	24.66	24.59	0	0
	1	50	25.21	24.59	24.66		0
	1	99	24.95	24.55	24.68		0
	50	0	24.31	23.67	23.58	0-1	1
	50	25	24.30	23.57	23.61		1
	50	50	24.26	23.50	23.53		1
16QAM	100	0	24.29	23.60	23.57	0-1	1
	1	0	24.02	24.15	23.93		1
	1	50	23.94	24.05	23.84		1
	1	99	23.70	24.05	23.81	0-2	1
	50	0	23.32	22.63	22.57		2
	50	25	23.30	22.53	22.61		2
64QAM	50	50	23.26	22.46	22.54	0-2	2
	100	0	23.28	22.60	22.54		2
	1	0	23.48	22.74	22.72		0-2
	1	50	23.31	22.64	22.77	2	
	1	99	23.18	22.60	22.75	0-3	
	50	0	22.28	21.66	21.56		3
50	25	22.24	21.56	21.60	3		
256QAM	50	50	22.19	21.47	21.56	0-3	3
	100	0	22.24	21.61	21.57		3
	1	0	20.48	19.70	19.94		0-5
	1	50	20.45	19.69	19.93	5	
	1	99	20.27	19.66	19.92	5	
	50	0	20.40	19.71	19.63	5	
50	25	20.40	19.67	19.67	5		
50	50	20.31	19.60	19.61	5		
100	0	20.36	19.66	19.62	5		

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Table 10-13
LTE Band 66 (AWS) Antenna B Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) – 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132072 (1720.0 MHz)	132322 (1745.0 MHz)	132572 (1770.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.80	19.22	19.16	0	0
	1	50	19.83	19.20	19.20		0
	1	99	19.55	19.13	19.16		0
	50	0	19.91	19.24	19.15	0-1	0
	50	25	19.92	19.19	19.17		0
	50	50	19.82	19.12	19.11		0
	100	0	19.81	19.19	19.13		0
16QAM	1	0	20.04	19.71	19.57	0-1	0
	1	50	20.10	19.69	19.61		0
	1	99	19.75	19.64	19.53		0
	50	0	19.94	19.21	19.16	0-2	0
	50	25	19.94	19.17	19.18		0
	50	50	19.84	19.08	19.11		0
	100	0	19.88	19.20	19.16		0
64QAM	1	0	20.20	19.32	19.32	0-2	0
	1	50	20.25	19.29	19.34		0
	1	99	19.92	19.23	19.29		0
	50	0	19.90	19.24	19.16	0-3	0
	50	25	19.91	19.20	19.21		0
	50	50	19.79	19.11	19.15		0
	100	0	19.88	19.21	19.18		0
256QAM	1	0	20.04	19.21	19.40	0-5	0
	1	50	20.08	19.20	19.45		0
	1	99	19.80	19.16	19.41		0
	50	0	19.93	19.24	19.16		0
	50	25	19.93	19.19	19.20		0
	50	50	19.81	19.11	19.13		0
	100	0	19.90	19.20	19.15		0

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10.3.7 LTE Band 66 Antenna C

Table 10-14

LTE Band 66 (AWS) Antenna C Measured P_{limit} For ECI = 1 (Head) – 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132072 (1720.0 MHz)	132322 (1745.0 MHz)	132572 (1770.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.12	22.07	21.91	0	0
	1	50	22.10	22.06	21.92		0
	1	99	22.10	22.06	21.92		0
	50	0	22.11	22.06	21.92	0-1	0
	50	25	22.09	22.07	21.91		0
	50	50	22.10	22.05	21.92		0
16QAM	100	0	22.10	22.06	21.92	0-1	0
	1	0	22.09	22.06	21.92		0
	1	50	22.10	22.06	21.92		0
	1	99	22.10	22.06	21.92	0-2	0
	50	0	22.09	22.06	21.92		0
	50	25	22.09	22.06	21.92		0
64QAM	50	50	22.10	22.06	21.94	0-2	0
	100	0	22.10	22.06	21.92		0
	1	0	22.09	22.05	21.93		0-2
	1	50	22.09	22.05	21.92	0	
	1	99	22.09	22.05	21.92	0	
	256QAM	50	0	22.09	22.05	21.93	0-3
50		25	22.09	22.05	21.91	0	
50		50	22.10	22.05	21.92	0	
100		0	22.08	22.06	21.92	0-5	0
1		0	20.48	19.99	19.43		2
1		50	20.47	19.97	19.50		2
256QAM	1	99	20.11	19.80	19.46	0-5	2
	50	0	20.34	19.74	19.62		2
	50	25	20.24	19.72	19.66		2
	50	50	20.11	19.60	19.57	2	
	100	0	20.21	19.71	19.66	2	

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Table 10-15
LTE Band 66 (AWS) Antenna C Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) – 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132072 (1720.0 MHz)	132322 (1745.0 MHz)	132572 (1770.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.83	20.49	20.44	0	0
	1	50	20.81	20.38	20.53		0
	1	99	20.56	20.33	20.48		0
	50	0	20.96	20.42	20.43	0-1	0
	50	25	20.89	20.38	20.49		0
	50	50	20.82	20.28	20.47		0
	100	0	20.80	20.38	20.46	0	
16QAM	1	0	20.99	20.96	20.40	0-1	0
	1	50	20.95	20.89	20.51		0
	1	99	20.75	20.81	20.53		0
	50	0	20.94	20.39	20.43	0-2	0
	50	25	20.86	20.34	20.49		0
	50	50	20.82	20.27	20.46		0
	100	0	20.94	20.44	20.47	0	
64QAM	1	0	20.98	20.20	20.36	0-2	0
	1	50	21.00	20.14	20.46		0
	1	99	21.00	20.07	20.44		0
	50	0	20.97	20.47	20.41	0-3	0
	50	25	20.86	20.43	20.50		0
	50	50	20.80	20.33	20.52		0
	100	0	20.91	20.43	20.46	0	
256QAM	1	0	19.96	19.98	19.85	0-5	0.5
	1	50	19.93	19.92	19.97		0.5
	1	99	19.70	19.84	19.85		0.5
	50	0	19.86	19.96	19.91		0.5
	50	25	19.78	19.90	19.98		0.5
	50	50	19.73	19.82	19.99		0.5
	100	0	19.82	19.92	19.98		0.5

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10.3.8 LTE Band 25 Antenna B

Table 10-16
LTE Band 25 (PCS) Antenna B Measured P_{Max} and/or P_{limit} for ECI = 1 (head) – 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26140 (1860.0 MHz)	26365 (1882.5 MHz)	26590 (1905.0 MHz)		
Conducted Power [dBm]							
QPSK	1	0	24.30	24.56	24.29	0	0
	1	50	24.18	24.37	24.04		0
	1	99	24.33	24.31	24.13		0
	50	0	23.81	23.95	23.81	0-1	1
	50	25	23.82	23.89	23.69		1
	50	50	23.85	23.86	23.60		1
	100	0	23.80	23.89	23.70		1
16QAM	1	0	23.54	23.74	23.66	0-1	1
	1	50	23.59	23.74	23.47		1
	1	99	23.66	23.56	23.51		1
	50	0	22.78	22.91	22.81	0-2	2
	50	25	22.79	22.88	22.65		2
	50	50	22.82	22.82	22.63		2
	100	0	22.79	22.89	22.73		2
64QAM	1	0	22.41	22.62	22.60	0-2	2
	1	50	22.47	22.57	22.28		2
	1	99	22.65	22.48	22.33		2
	50	0	21.78	21.92	21.78	0-3	3
	50	25	21.78	21.87	21.64		3
	50	50	21.81	21.82	21.61		3
	100	0	21.79	21.90	21.72		3
256QAM	1	0	19.90	19.99	19.87	0-5	5
	1	50	19.89	19.92	19.80		5
	1	99	19.91	19.90	19.91		5
	50	0	19.92	19.89	19.85		5
	50	25	19.94	19.91	19.76		5
	50	50	19.97	19.94	19.74		5
	100	0	19.97	19.96	19.84		5

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Table 10-17
LTE Band 25 (PCS) Antenna B Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) – 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26140 (1860.0 MHz)	26365 (1882.5 MHz)	26590 (1905.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.02	20.23	20.02	0	0
	1	50	19.99	20.15	20.01		0
	1	99	20.10	20.02	19.85		0
	50	0	20.02	20.22	19.95	0-1	0
	50	25	20.05	20.13	19.88		0
	50	50	20.06	20.09	19.85		0
16QAM	100	0	20.07	20.13	19.94	0-1	0
	1	0	20.35	20.49	20.43		0
	1	50	20.31	20.45	20.04		0
	1	99	20.42	20.40	20.18	0-2	0
	50	0	20.02	20.23	19.97		0
	50	25	20.03	20.16	19.86		0
64QAM	50	50	20.03	20.07	19.86	0-2	0
	100	0	20.05	20.17	19.96		0
	1	0	20.21	20.43	20.27		0-3
	1	50	20.24	20.31	19.91	0	
	1	99	20.30	20.22	20.05	0	
	256QAM	50	0	20.03	20.21	19.95	0-3
50		25	20.03	20.14	19.86	0	
50		50	20.05	20.06	19.88	0	
100		0	20.07	20.18	19.95	0-5	0
1		0	20.15	20.38	20.21		0
1		50	20.06	20.27	19.89		0
256QAM	1	99	20.16	20.17	19.90	0-5	0
	50	0	20.01	20.20	19.94		0
	50	25	20.03	20.14	19.85		0
	50	50	20.02	20.06	19.88	0	
	100	0	20.05	20.17	19.96	0	

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10.3.9 LTE Band 25 Antenna C

Table 10-18
LTE Band 25 Antenna C Measured P_{limit} For ECI = 1 (Head) – 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26140 (1860.0 MHz)	26365 (1882.5 MHz)	26590 (1905.0 MHz)		
Conducted Power [dBm]							
QPSK	1	0	21.42	22.08	22.19	0	0
	1	50	21.54	22.08	22.20		0
	1	99	21.55	22.08	22.21		0
	50	0	21.63	22.07	22.21	0-1	0
	50	25	21.66	22.07	22.21		0
	50	50	21.73	22.06	22.22		0
	100	0	21.68	22.06	22.20		0
16QAM	1	0	21.33	22.06	22.21	0-1	0
	1	50	21.43	22.06	22.19		0
	1	99	21.45	22.07	22.21		0
	50	0	21.65	22.06	22.21	0-2	0
	50	25	21.69	22.08	22.20		0
	50	50	21.73	22.08	22.19		0
	100	0	21.70	22.06	22.22		0
64QAM	1	0	22.01	22.06	22.21	0-2	0
	1	50	22.13	22.06	22.22		0
	1	99	22.16	22.09	22.20		0
	50	0	21.63	22.08	22.19	0-3	0
	50	25	21.67	22.09	22.20		0
	50	50	21.73	22.09	22.19		0
	100	0	21.68	22.07	22.22		0
256QAM	1	0	19.76	19.50	19.73	0-5	2
	1	50	19.86	19.64	19.78		2
	1	99	19.89	19.38	19.91		2
	50	0	19.65	19.73	19.52		2
	50	25	19.68	19.69	19.57		2
	50	50	19.73	19.59	19.56		2
	100	0	19.71	19.74	19.52		2

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Table 10-19
LTE Band 25 Antenna C Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) – 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26140 (1860.0 MHz)	26365 (1882.5 MHz)	26590 (1905.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.36	20.52	20.36	0	0
	1	50	20.39	20.56	20.31		0
	1	99	20.48	20.42	20.48		0
	50	0	20.51	20.60	20.36	0-1	0
	50	25	20.52	20.52	20.32		0
	50	50	20.59	20.45	20.31		0
16QAM	100	0	20.55	20.52	20.31	0-1	0
	1	0	20.86	20.82	20.34		0
	1	50	20.85	20.84	20.30		0
	1	99	20.94	20.91	20.49	0-2	0
	50	0	20.49	20.52	20.67		0
	50	25	20.50	20.47	20.32		0
64QAM	50	50	20.58	20.38	20.33	0-2	0
	100	0	20.59	20.55	20.31		0
	1	0	20.82	20.26	20.27		0-2
	1	50	20.82	20.30	20.23	0	
	1	99	20.90	20.15	20.43	0	
	256QAM	50	0	20.50	20.58	20.36	0-3
50		25	20.50	20.55	20.38	0	
50		50	20.57	20.49	20.37	0	
100		0	20.56	20.53	20.34	0-5	0
1		0	19.73	19.63	19.63		0.5
1		50	19.72	19.65	19.56		0.5
256QAM	1	99	19.81	19.50	19.79	0-5	0.5
	50	0	19.60	19.68	19.44		0.5
	50	25	19.61	19.62	19.44		0.5
	50	50	19.67	19.54	19.42	0.5	
	100	0	19.66	19.65	19.40	0.5	

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10.3.10 LTE Band 30 Antenna B

Table 10-20
LTE Band 30 Antenna A Measured P_{Max} and/or P_{limit} ECI = 1 (head) – 10 MHz Bandwidth

LTE Band 30 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			27710 (2310.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	22.47	0	0
	1	25	22.49		0
	1	49	22.40		0
	25	0	21.51	0-1	1
	25	12	21.46		1
	25	25	21.45		1
	50	0	21.47		1
16QAM	1	0	21.83	0-1	1
	1	25	21.79		1
	1	49	21.85		1
	25	0	20.54	0-2	2
	25	12	20.49		2
	25	25	20.46		2
	50	0	20.48		2
64QAM	1	0	20.73	0-2	2
	1	25	20.70		2
	1	49	20.69		2
	25	0	19.64	0-3	3
	25	12	19.60		3
	25	25	19.61		3
	50	0	19.66		3
256QAM	1	0	17.71	0-5	5
	1	25	17.68		5
	1	49	17.79		5
	25	0	17.65		5
	25	12	17.58		5
	25	25	17.59		5
	50	0	17.59		5

Note: LTE Band 30 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, 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.

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Table 10-21
LTE Band 30 Measured Antenna B P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) - 10 MHz Bandwidth

LTE Band 30 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			27710 (2310.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	18.82	0	0
	1	25	18.79		0
	1	49	18.78		0
	25	0	18.81	0-1	0
	25	12	18.79		0
	25	25	18.74		0
	50	0	18.78		0
16QAM	1	0	19.19	0-1	0
	1	25	19.10		0
	1	49	19.00		0
	25	0	18.81	0-2	0
	25	12	18.78		0
	25	25	18.76		0
	50	0	18.79		0
64QAM	1	0	19.04	0-2	0
	1	25	19.04		0
	1	49	19.00		0
	25	0	18.78	0-3	0
	25	12	18.77		0
	25	25	18.76		0
	50	0	18.81		0
256QAM	1	0	18.06	0-5	1
	1	25	17.87		1
	1	49	17.90		1
	25	0	17.78		1
	25	12	17.77		1
	25	25	17.74		1
	50	0	17.31		1

Note: LTE Band 30 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, 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.

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10.3.11 LTE Band 7 Antenna B

Table 10-22
LTE Band 7 Antenna B Measured P_{Max} and/or ECI = 1 (head) – 20 MHz Bandwidth

LTE Band 7 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20850 (2510.0 MHz)	21100 (2535.0 MHz)	21350 (2560.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.12	22.84	22.94	0	0
	1	50	23.01	22.91	22.93		0
	1	99	22.57	22.74	22.77		0
	50	0	22.18	21.91	21.88	0-1	1
	50	25	22.17	21.88	21.92		1
	50	50	22.14	21.84	21.83		1
	100	0	22.16	21.88	21.83		1
16QAM	1	0	21.83	22.24	21.89	0-1	1
	1	50	21.80	22.35	21.76		1
	1	99	21.59	21.95	21.76		1
	50	0	21.21	20.87	20.87	0-2	2
	50	25	21.17	20.84	20.91		2
	50	50	21.14	20.79	20.81		2
	100	0	21.16	20.89	20.81		2
64QAM	1	0	21.04	20.93	21.05	0-2	2
	1	50	20.98	20.98	21.04		2
	1	99	20.92	20.91	21.01		2
	50	0	20.15	19.90	19.86	0-3	3
	50	25	20.14	19.87	19.90		3
	50	50	20.09	19.85	19.82		3
	100	0	20.13	19.90	19.83		3
256QAM	1	0	18.32	18.03	18.22	0-5	5
	1	50	18.25	17.99	18.12		5
	1	99	18.19	17.98	18.01		5
	50	0	18.12	18.03	17.89		5
	50	25	18.10	18.00	17.91		5
	50	50	18.10	17.95	17.81		5
	100	0	18.11	18.03	17.86		5

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Table 10-23
LTE Band 7 Antenna B Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) - 20 MHz Bandwidth

LTE Band 7 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20850 (2510.0 MHz)	21100 (2535.0 MHz)	21350 (2560.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.67	19.11	19.03	0	0
	1	50	19.62	19.08	18.97		0
	1	99	19.33	18.95	18.95		0
	50	0	19.63	19.10	18.96	0-1	0
	50	25	19.58	19.02	18.99		0
	50	50	19.51	18.93	18.90		0
	100	0	19.56	19.03	18.89		0
16QAM	1	0	19.98	19.51	19.40	0-1	0
	1	50	19.80	19.47	19.28		0
	1	99	19.60	19.28	19.34		0
	50	0	19.62	19.10	18.93	0-2	0
	50	25	19.57	19.02	19.00		0
	50	50	19.53	18.94	18.92		0
	100	0	19.61	19.08	18.94		0
64QAM	1	0	19.90	19.31	19.22	0-2	0
	1	50	19.83	19.34	19.18		0
	1	99	19.52	19.18	19.22		0
	50	0	19.67	19.10	18.98	0-3	0
	50	25	19.61	19.02	19.01		0
	50	50	19.54	18.96	18.92		0
	100	0	19.62	19.06	18.94		0
256QAM	1	0	18.85	18.44	18.25	0-5	1
	1	50	18.70	18.29	18.23		1
	1	99	18.56	18.21	18.05		1
	50	0	18.64	18.22	18.02		1
	50	25	18.59	18.16	18.05		1
	50	50	18.54	18.07	17.95		1
	100	0	18.62	18.18	18.02		1

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10.3.12 LTE Band 41 Antenna B

Table 10-24
LTE Band 41 PC3 Antenna B Measured P_{limit} For ECI = 1 (head) – 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
Conducted Power [dBm]									
QPSK	1	0	22.76	22.68	22.55	22.54	22.79	0	0
	1	50	22.87	22.65	22.68	22.54	22.88		0
	1	99	22.84	22.50	22.55	22.49	22.75		0
	50	0	22.77	22.63	22.58	22.47	22.83	0-1	0
	50	25	22.83	22.61	22.63	22.51	22.84		0
	50	50	22.81	22.57	22.58	22.48	22.80		0
16QAM	100	0	22.81	22.57	22.56	22.49	22.80	0-1	0
	1	0	22.99	22.90	22.77	22.73	22.98		0
	1	50	23.10	22.89	22.91	22.73	23.10		0
	1	99	23.05	22.69	22.74	22.68	22.95	0-2	0
	50	0	22.41	22.26	22.22	22.12	22.48		0.4
	50	25	22.50	22.23	22.25	22.14	22.48		0.4
64QAM	50	50	22.46	22.20	22.21	22.10	22.45	0-2	0.4
	100	0	22.48	22.25	22.24	22.17	22.51		0.4
	1	0	22.35	22.26	22.13	22.08	22.35		0.4
	1	50	22.46	22.24	22.25	22.09	22.45	0-3	0.4
	1	99	22.39	22.06	22.09	22.04	22.32		0.4
	50	0	21.43	21.31	21.25	21.15	21.51		1.4
256QAM	50	25	21.50	21.27	21.30	21.18	21.51	0-3	1.4
	50	50	21.48	21.23	21.27	21.15	21.45		1.4
	100	0	21.44	21.25	21.22	21.15	21.48		1.4
	1	0	19.34	19.25	19.14	19.11	19.34	0-5	3.4
	1	50	19.44	19.23	19.26	19.08	19.43		3.4
	1	99	19.38	19.05	19.12	19.06	19.30		3.4
50	0	19.43	19.31	19.25	19.18	19.52	3.4		
50	25	19.50	19.29	19.31	19.19	19.52	3.4		
50	50	19.48	19.25	19.28	19.15	19.50	3.4		
100	0	19.45	19.22	19.21	19.15	19.48	3.4		

Table 10-25
LTE Band 41 PC2 Antenna B Measured P_{limit} For ECI = 1 (head) – 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
Conducted Power [dBm]									
QPSK	1	0	24.38	24.21	24.09	24.06	24.25	0	0
	1	50	24.29	24.18	24.22	24.04	24.36		0
	1	99	24.30	24.00	24.08	24.00	24.25		0
	50	0	24.22	24.14	24.10	24.01	24.35	0-1	0
	50	25	24.35	24.12	24.15	24.02	24.35		0
	50	50	24.33	24.07	24.11	23.99	24.32		0
100	0	24.32	24.09	24.10	24.00	24.35	0		

Table 10-26
LTE Band 41 Antenna B Uplink Carrier Aggregation Measured P_{limit} For ECI = 1 (head)

Combination	PCC							SCC							Power	
	PCC Band	PCC Bandwidth [MHz]	PCC (UL/DL) Channel	PCC (UL/DL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL/DL) Channel	SCC (UL/DL) Frequency [MHz]	Modulation	SCC UL# RB	SCC UL RB Offset	LTE Tx.Power with UL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41C	LTE B41	20	41490	2680.0	QPSK	1	0	LTE B41	20	41292	2660.2	QPSK	1	99	22.70	22.79

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Table 10-27

LTE Band 41 Antenna B PC3 Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth										
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)			
			Conducted Power [dBm]							
QPSK	1	0	23.23	23.07	22.77	22.96	23.36	0	0	
	1	50	23.27	23.15	22.96	23.14	23.50		0	
	1	99	23.17	22.99	22.92	23.15	23.41		0	
	16QAM	50	0	23.29	23.09	22.94	23.13	23.47	0-1	0
		50	25	23.33	23.10	22.98	23.21	23.50		0
		50	50	23.27	23.08	22.97	23.24	23.49		0
100		0	23.29	23.04	22.94	23.19	23.48	0		
64QAM	1	0	23.74	23.68	23.46	23.57	23.99	0-1	0	
	1	50	23.79	23.75	23.64	23.69	23.95		0	
	1	99	23.71	23.60	23.61	23.69	23.73		0	
	256QAM	50	0	22.32	22.07	21.88	22.10	22.48	0-2	1
		50	25	22.38	22.09	21.96	22.25	22.49		1
		50	50	22.31	22.07	21.97	22.24	22.47		1
100		0	22.33	22.07	21.96	22.21	22.47	1		
64QAM	1	0	22.70	21.99	22.44	22.41	22.29	0-2	1	
	1	50	22.72	22.07	22.63	22.54	22.42		1	
	1	99	22.59	21.93	22.57	22.57	22.29		1	
	256QAM	50	0	21.33	21.08	20.89	21.12	21.47	0-3	2
		50	25	21.36	21.06	20.97	21.22	21.46		2
		50	50	21.32	21.04	20.97	21.26	21.41		2
100		0	21.34	21.06	20.93	21.21	21.45	2		
256QAM	1	0	19.64	19.16	19.12	19.39	19.49	0-5	4	
	1	50	19.67	19.21	19.27	19.52	19.61		4	
	1	99	19.57	19.06	19.22	19.54	19.45		4	
	50	0	19.25	19.04	18.84	19.08	19.47		4	
	50	25	19.30	19.06	18.90	19.14	19.45		4	
	50	50	19.25	19.03	18.91	19.17	19.42		4	
100	0	19.28	19.03	18.90	19.16	19.41	4			

Table 10-28

LTE Band 41 PC2 Antenna B PC2 Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth										
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)			
			Conducted Power [dBm]							
QPSK	1	0	25.50	25.18	25.11	25.21	25.44	0	0	
	1	50	25.60	25.15	25.25	25.21	25.55		0	
	1	99	25.51	24.97	25.12	25.17	25.43		0	
	16QAM	50	0	24.57	24.15	24.17	24.19	24.60	0-1	0.1
		50	25	24.63	24.34	24.22	24.24	24.59		0.1
		50	50	24.62	24.27	24.19	24.21	24.55		0.1
100		0	24.57	24.29	24.17	24.21	24.58	0.1		

Table 10-29

LTE Band 41 Antenna B Uplink Carrier Aggregation Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) - 20 MHz Bandwidth

Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL/DL) Channel	PCC (UL/DL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL/DL) Channel	SCC (UL/DL) Frequency [MHz]	Modulation	SCC UL# RB	SCC UL RB Offset	LTE Tx.Power with UL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41C	LTE B41	20	41490	2680.0	QPSK	1	0	LTE B41	20	41292	2660.2	QPSK	1	99	23.26	23.36

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10.3.13 LTE Band 48 Antenna F

Table 10-30
LTE Band 48 Antenna F Measured P_{limit} For ECI = 1 (head) - 20 MHz Bandwidth

LTE Band 48 20 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			55340 (3560.0 MHz)	55773 (3603.3 MHz)	56207 (3646.7 MHz)	56640 (3690.0 MHz)		
			Conducted Power [dBm]					
QPSK	1	0	18.20	18.50	18.31	18.04	0	0
	1	50	18.33	18.41	18.19	18.26		0
	1	99	18.49	18.31	18.19	18.45		0
	50	0	18.25	18.50	18.32	18.12	0-1	0
	50	25	18.36	18.46	18.27	18.28		0
	50	50	18.42	18.45	18.22	18.38		0
	100	0	18.35	18.39	18.25	18.28		0
16QAM	1	0	18.13	18.47	18.25	17.99	0-1	0
	1	50	18.36	18.35	18.22	18.24		0
	1	99	18.43	18.25	18.14	18.42		0
	50	0	18.30	18.51	18.27	18.22	0-2	0
	50	25	18.39	18.45	18.33	18.30		0
	50	50	18.49	18.44	18.22	18.43		0
	100	0	18.42	18.52	18.33	18.32		0
64QAM	1	0	17.90	18.29	18.05	17.81	0-2	0
	1	50	18.07	18.17	18.09	18.04		0
	1	99	18.28	18.05	17.96	18.23		0
	50	0	18.30	18.04	18.36	18.25	0-3	0
	50	25	18.44	18.54	18.34	18.35		0
	50	50	18.48	18.51	18.30	18.39		0
	100	0	18.41	18.46	18.32	18.31		0
256QAM	1	0	17.06	17.33	17.21	17.10	0-5	1
	1	50	17.19	17.31	17.12	17.11		1
	1	99	17.38	17.19	17.09	17.40		1
	50	0	17.37	17.61	17.37	17.24		1
	50	25	17.39	17.50	17.33	17.36		1
	50	50	17.46	17.48	17.27	17.44		1
	100	0	17.37	17.46	17.31	17.32		1

Table 10-31
LTE Band 48 Antenna F Uplink Carrier Aggregation Measured P_{limit} For ECI = 1 (head)
- 20 MHz Bandwidth

Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL/DL) Channel	PCC (UL/DL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL/DL) Channel	SCC (UL/DL) Frequency [MHz]	Modulation	SCC UL# RB	SCC UL RB Offset	LTE Tx.Power with UL CA Enabled [dBm]	LTE Single Carrier Tx Power [dBm]
CA_48C	LTE B48	20	55773	3603.3	QPSK	1	0	LTE B48	20	55575	3583.5	QPSK	1	99	18.40	18.50

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Table 10-32
LTE Band 48 Measured P_{max} for ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) - 20 MHz Bandwidth

LTE Band 48 20 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			55340 (3560.0 MHz)	55773 (3603.3 MHz)	56207 (3646.7 MHz)	56640 (3690.0 MHz)		
			Conducted Power [dBm]					
QPSK	1	0	22.21	22.44	22.27	22.05	0	0
	1	50	22.33	22.37	22.16	22.28		0
	1	99	22.41	22.22	22.25	22.55		0
	50	0	21.23	21.49	21.34	21.22	0-1	1
	50	25	21.37	21.45	21.25	21.18		1
	50	50	21.39	21.37	21.21	21.56		1
100	0	21.32	21.41	21.25	21.48	1		
16QAM	1	0	21.18	21.47	21.26	21.07	0-1	1
	1	50	21.31	21.32	21.30	21.16		1
	1	99	21.40	21.25	21.22	21.42		1
	50	0	20.30	20.60	20.38	20.26	0-2	2
	50	25	20.43	20.54	20.34	20.18		2
	50	50	20.50	20.46	20.27	20.43		2
100	0	20.52	20.62	20.36	20.57	2		
64QAM	1	0	20.00	20.32	20.13	20.29	0-2	2
	1	50	20.12	20.26	20.01	20.30		2
	1	99	20.30	20.13	19.99	20.28		2
	50	0	19.38	19.57	19.41	19.28	0-3	3
	50	25	19.43	19.54	19.32	19.43		3
	50	50	19.52	19.46	19.26	19.49		3
100	0	19.42	19.50	19.30	19.37	3		
256QAM	1	0	17.10	17.44	17.25	16.97	0-5	5
	1	50	17.25	17.31	17.13	17.16		5
	1	99	17.41	17.24	17.10	17.36		5
	50	0	17.40	17.64	17.44	17.26	0-5	5
	50	25	17.43	17.52	17.33	17.40		5
	50	50	17.54	17.55	17.34	17.45		5
100	0	17.40	17.53	17.34	17.37	5		

Table 10-33
LTE Band 48 Uplink Carrier Aggregation Measured P_{max} for ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) - 20 MHz Bandwidth

Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL/DL) Channel	PCC (UL/DL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL/DL) Channel	SCC (UL/DL) Frequency [MHz]	Modulation	SCC UL# RB	SCC UL RB Offset	LTE Tx Power with UL CA Enabled [dBm]	LTE Single Carrier Tx Power [dBm]
CA_48C	LTE B48	20	56640	3690.0	QPSK	1	0	LTE B48	20	56442	3670.2	QPSK	1	99	22.22	22.05

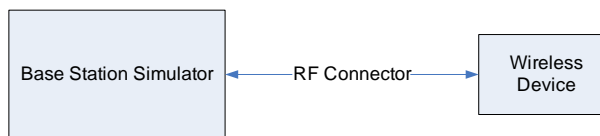


Figure 10-3
Power Measurement Setup

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10.4 NR Conducted Powers

Per October 2020 TCB Workshop Guidance, NR FR1 SAR evaluations are being generally based on adapting the existing LTE SAR procedures (FCC KDB Publication 941225 D05v02r05). Therefore, NR SAR for the lower bandwidths was not required for testing based on the measured output power and the reported NR SAR for the highest bandwidth. Lower bandwidth conducted powers for all NR bands can be found in LTE and NR Lower Bandwidth RF Conducted Powers Appendix.

Note: Some bands do not support non-overlapping channels. Per FCC Guidance, 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.

10.4.1 NR Band n71 Antenna A

Table 10-34
NR Band n71 Antenna A Measured P_{Max} for all ECI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			136100 (680.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	23.69	0	0.0
	1	53	23.85		0.0
	1	104	24.00		0.0
	50	0	22.84	0-1	1.0
	50	28	23.92	0	0.0
	50	56	23.12	0-1	1.0
	100	0	22.94		1.0
DFT-s-OFDM 16QAM	1	1	22.89	0-1	1.0
CP-OFDM QPSK	1	1	22.15	0-1.5	1.5

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10.4.2 NR Band n5 Antenna A

Table 10-35
NR Band n5 Antenna A Measured P_{Max} and/or P_{limit} ECI = 1 (head) - 20 MHz Bandwidth

NR Band n5 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			167300 (836.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	23.52	0	0.0
	1	53	23.61		0.0
	1	104	23.57		0.0
	50	0	22.77	0-1	1.0
	50	28	23.72	0	0.0
	50	56	22.77	0-1	1.0
	100	0	22.75		1.0
DFT-s-OFDM 16QAM	1	1	22.75	0-1	1.0
CP-OFDM QPSK	1	1	22.01	0-1.5	1.5

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Table 10-36
NR Band n5 Antenna A Antenna A Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) - 20 MHz Bandwidth

NR Band n5 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			167300 (836.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	23.07	0	0.0
	1	53	23.38		0.0
	1	104	23.12		0.0
	50	0	23.27	0-1	0.0
	50	28	23.33	0	0.0
	50	56	23.26	0-1	0.0
	100	0	23.30		0.0
DFT-s-OFDM 16QAM	1	1	23.31	0-1	0.0
CP-OFDM QPSK	1	1	22.63	0-1.5	0.5

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10.4.3 NR Band n70 Antenna B

Table 10-37
NR Band n70 Antenna B Measured P_{Max} and/or P_{limit} ECI = 1 (head) - 15 MHz Bandwidth

NR Band n70 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			340500 (1702.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	24.20	0	0.0
	1	40	24.36		0.0
	1	77	24.35		0.0
	36	0	23.92	0-1	1.0
	36	22	24.91	0	0.0
	36	43	23.85	0-1	1.0
	75	0	23.91		1.0
DFT-s-OFDM 16QAM	1	1	23.48	0-1	1.0
CP-OFDM QPSK	1	1	22.65	0-1.5	1.5

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Table 10-38
NR Band n70 Antenna B Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) - 15 MHz Bandwidth

NR Band n70 15 MHz Bandwidth						
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	Deviation 340500 [dB]
			340500 (1702.5 MHz) Conducted Power [dBm]			
DFT-s-OFDM QPSK	1	1	22.34	0	0.0	0.34
	1	40	22.45		0.0	0.45
	1	77	22.39		0.0	0.39
	36	0	22.45	0-1	0.0	0.45
	36	22	22.44	0	0.0	0.44
	36	43	22.40	0-1	0.0	0.40
	75	0	22.44		0.0	0.44
DFT-s-OFDM 16QAM	1	1	22.45	0-1	0.0	0.45
CP-OFDM QPSK	1	1	22.24	0-1.5	0.0	0.24

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10.4.4 NR Band n66 Antenna B

Table 10-39
NR Band n66 Antenna B Measured P_{Max} and/or P_{limit} ECI = 1 (head) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			349000 (1745 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	23.86	0	0.0
	1	108	23.38		0.0
	1	214	23.31		0.0
	108	0	23.12	0-1	1.0
	108	54	23.87	0	0.0
	108	108	22.83	0-1	1.0
	216	0	23.00		1.0
DFT-s-OFDM 16QAM	1	1	22.93	0-1	1.0
CP-OFDM QPSK	1	1	22.25	0-1.5	1.5

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Table 10-40
NR Band n66 Antenna A Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			349000 (1745 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	19.36	0	0.0
	1	108	18.91		0.0
	1	214	18.88		0.0
	108	0	19.13	0-1	0.0
	108	54	18.94	0	0.0
	108	108	18.85	0-1	0.0
	216	0	19.01		0.0
DFT-s-OFDM 16QAM	1	1	19.45	0-1	0.0
CP-OFDM QPSK	1	1	19.28	0-1.5	0.0

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10.4.5 NR Band n66 Antenna C

Table 10-41
NR Band n66 Antenna C Measured P_{limit} For ECI = 1 (Head) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			349000 (1745 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	20.93	0	0.0
	1	108	20.68		0.0
	1	214	20.69		0.0
	108	0	20.79	0-1	0.0
	108	54	20.80	0	0.0
	108	108	20.65	0-1	0.0
	216	0	20.74		0.0
DFT-s-OFDM 16QAM	1	1	21.04	0-1	0.0
CP-OFDM QPSK	1	1	20.84	0-1.5	0.0

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Table 10-42
NR Band n66 Antenna C Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			349000 (1745 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	20.33	0	0.0
	1	108	20.49		0.0
	1	214	20.13		0.0
	108	0	20.44	0-1	0.0
	108	54	20.53	0	0.0
	108	108	20.32	0-1	0.0
	216	0	20.40		0.0
DFT-s-OFDM 16QAM	1	1	20.46	0-1	0.0
CP-OFDM QPSK	1	1	20.25	0-1.5	0.0

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10.4.6 NR Band n25 Antenna B

Table 10-43
NR Band n25 Antenna B Measured P_{limit} For ECI = 1 (Head) - 40 MHz Bandwidth

NR Band n25 40 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			376500 (1882.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	24.43	0	0.0
	1	108	24.74		0.0
	1	214	24.46		0.0
	108	0	24.25	0-1	1.0
	108	54	25.29	0	0.0
	108	108	24.14	0-1	1.0
	216	0	24.20		1.0
DFT-s-OFDM 16QAM	1	1	23.56	0-1	1.0
CP-OFDM QPSK	1	1	22.84	0-1.5	1.5

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Table 10-44
NR Band n25 Antenna B Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) - 40 MHz Bandwidth

NR Band n25 40 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			376500 (1882.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	19.98	0	0.0
	1	108	20.30		0.0
	1	214	19.94		0.0
	108	0	20.32	0-1	0.0
	108	54	20.37	0	0.0
	108	108	20.14	0-1	0.0
	216	0	20.25		0.0
DFT-s-OFDM 16QAM	1	1	20.07	0-1	0.0
CP-OFDM QPSK	1	1	19.92	0-1.5	0.0

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10.4.7 NR Band n2 Antenna C

Table 10-45
NR Band n2 Antenna C Measured P_{limit} For ECI = 1 (Head) - 40 MHz Bandwidth

NR Band n2 40 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			376000 (1880 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	21.91	0	0.0
	1	108	22.09		0.0
	1	214	21.88		0.0
	108	0	21.96	0-1	0.0
	108	54	22.11	0	0.0
	108	108	21.88	0-1	0.0
	216	0	21.97		0.0
DFT-s-OFDM 16QAM	1	1	22.07	0-1	0.0
CP-OFDM QPSK	1	1	21.81	0-1.5	0.0

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Table 10-46
NR Band n2 Antenna C Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) - 40 MHz Bandwidth

NR Band n2 40 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			376000 (1880 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	20.33	0	0.0
	1	108	20.49		0.0
	1	214	20.13		0.0
	108	0	20.44	0-1	0.0
	108	54	20.53	0	0.0
	108	108	20.32	0-1	0.0
	216	0	20.40		0.0
DFT-s-OFDM 16QAM	1	1	20.46	0-1	0.0
CP-OFDM QPSK	1	1	20.25	0-1.5	0.0

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10.4.8 NR Band n41 Antenna B

Table 10-47
NR Band n41 Antenna B Measured P_{limit} For ECI = 1 (Head) - 100 MHz Bandwidth

NR Band n41 100 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			518598 (2592.99 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	17.50	0	0.0
	1	137	17.99		0.0
	1	271	17.51		0.0
	135	0	17.80	0-1	0.0
	135	69	17.97	0	0.0
	135	138	17.96	0-1	0.0
	270	0	17.90		0.0
DFT-s-OFDM 16QAM	1	1	17.28	0-1	0.0
CP-OFDM QPSK	1	1	17.60	0-1.5	0.0

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Table 10-48
NR Band n41 Antenna B Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) - 100 MHz Bandwidth

NR Band n41 100 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			518598 (2592.99 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	16.46	0	0.0
	1	137	16.97		0.0
	1	271	16.50		0.0
	135	0	16.77	0-1	0.0
	135	69	16.91	0	0.0
	135	138	16.89	0-1	0.0
	270	0	16.78		0.0
DFT-s-OFDM 16QAM	1	1	16.20	0-1	0.0
CP-OFDM QPSK	1	1	16.51	0-1.5	0.0

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10.4.9 NR Band n48 Antenna F

Table 10-49
NR Band n48 Antenna F Measured P_{limit} For ECI = 1 (Head) - 40 MHz Bandwidth

NR Band n48 40 MHz Bandwidth							
Modulation	RB Size	RB Offset	Channel			MPR Allowed per 3GPP [dB]	MPR [dB]
			638000 (3570 MHz)	641666 (3624.99 MHz)	645332 (3679.98 MHz)		
			Conducted Power [dBm]				
DFT-s-OFDM QPSK	1	1	12.99	13.75	12.54	0	0.0
	1	53	13.81	13.81	12.22		0.0
	1	104	13.87	13.29	12.26		0.0
	50	0	13.37	13.74	12.37	0-1	0.0
	50	28	13.74	13.76	12.28	0	0.0
	50	56	13.87	13.57	12.28	0-1	0.0
	100	0	13.59	13.70	12.33		0.0
DFT-s-OFDM 16QAM	1	1	12.92	13.52	12.30	0-1	0.0
CP-OFDM QPSK	1	1	13.01	13.77	12.57	0-1.5	0.0

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Table 10-50
NR Band n48 Antenna F Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) - 40 MHz Bandwidth

NR Band n48 40 MHz Bandwidth							
Modulation	RB Size	RB Offset	Channel			MPR Allowed per 3GPP [dB]	MPR [dB]
			638000 (3570 MHz)	641666 (3624.99 MHz)	645332 (3679.98 MHz)		
			Conducted Power [dBm]				
DFT-s-OFDM QPSK	1	1	17.11	17.81	16.61	0	0.0
	1	53	17.90	17.82	16.29		0.0
	1	104	18.00	17.38	16.31		0.0
	50	0	17.50	17.83	16.41	0-1	0.0
	50	28	17.83	17.84	16.32	0	0.0
	50	56	17.99	17.65	16.32	0-1	0.0
	100	0	17.72	17.77	16.37		0.0
DFT-s-OFDM 16QAM	1	1	17.01	17.64	16.41	0-1	0.0
CP-OFDM QPSK	1	1	17.13	17.92	16.66	0-1.5	0.0

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10.4.10 NR Band n48 Antenna E, H, G

Table 10-51
NR Band n48 Antenna E, H, G Measured P_{limit} For ECI = 1 (Head) - 40 MHz Bandwidth

NR Band n48 40 MHz Bandwidth			
Channel			
Antenna	638000 (3570 MHz)	641666 (3624.99 MHz)	645332 (3679.98 MHz)
	Conducted Power [dBm]		
SRS #1 Ant E	11.87	11.70	10.29
SRS #2 Ant H	9.17	8.76	7.18
SRS #3 Ant G	9.53	9.51	8.04

Table 10-52
NR Band n48 Antenna E, H, G Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) - 40 MHz Bandwidth

NR Band n48 40 MHz Bandwidth			
Channel			
Antenna	638000 (3570 MHz)	641666 (3624.99 MHz)	645332 (3679.98 MHz)
	Conducted Power [dBm]		
SRS #1 Ant E	14.90	14.66	13.33
SRS #2 Ant H	12.08	11.72	10.26
SRS #3 Ant G	12.51	12.48	11.11

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10.4.11 NR Band n77 DoD Antenna F

Table 10-53
NR Band n77 DoD Antenna F Measured P_{limit} For ECI = 1 (Head) - 100 MHz Bandwidth

NR Band n77 DoD 100 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			633334 (3500.01 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	14.01	0	0.0
	1	137	13.51		0.0
	1	271	14.44		0.0
	135	0	13.56	0-1	0.0
	135	69	13.57	0	0.0
	135	138	14.05	0-1	0.0
	270	0	13.67		0.0
DFT-s-OFDM 16QAM	1	1	13.78	0-1	0.0
CP-OFDM QPSK	1	1	14.05	0-1.5	0.0

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Table 10-54

NR Band n77 DoD Antenna F Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) - 100 MHz Bandwidth

NR Band n77 DoD 100 MHz Bandwidth					
Modulation	RB Size	RB Offset	Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			633334 (3500.01 MHz) Conducted Power [dBm]		
DFT-s-OFDM QPSK	1	1	14.97	0	0.0
	1	137	14.58		0.0
	1	271	14.99		0.0
	135	0	14.57	0-1	0.0
	135	69	14.54	0	0.0
	135	138	14.92	0-1	0.0
	270	0	14.68		0.0
DFT-s-OFDM 16QAM	1	1	14.83	0-1	0.0
CP-OFDM QPSK	1	1	15.00	0-1.5	0.0

10.4.12 NR Band n77 DoD Antenna E, H, G

Table 10-55

NR Band n77 DoD Antenna E, H, G Measured P_{limit} For ECI = 1 (Head) – 100 MHz Bandwidth

NR Band n77 DoD 100 MHz Bandwidth	
Channel	
Antenna	633334 (3500.01 MHz) Conducted Power [dBm]
	SRS #1 Ant E
SRS #2 Ant H	8.53
SRS #3 Ant G	8.71

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Table 10-56
NR Band n77 DoD Antenna E, H, G Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) – 100 MHz Bandwidth

NR Band n77 DoD 100 MHz Bandwidth	
Channel	
Antenna	633334 (3500.01 MHz)
	Conducted Power [dBm]
SRS #1 Ant E	12.11
SRS #2 Ant H	8.78
SRS #3 Ant G	9.81

10.4.13 NR Band n77 Antenna F

Table 10-57
NR Band n77 Antenna F Measured P_{limit} For ECI = 1 (Head) - 100 MHz Bandwidth

NR Band n77 100 MHz Bandwidth						
Modulation	RB Size	RB Offset	Channel		MPR Allowed per 3GPP [dB]	MPR [dB]
			650000 (3750 MHz)	662000 (3930 MHz)		
			Conducted Power [dBm]			
DFT-s-OFDM QPSK	1	1	13.61	14.72	0	0.0
	1	137	14.28	14.96		0.0
	1	271	14.55	14.95		0.0
	135	0	13.88	14.95	0-1	0.0
	135	69	14.28	14.97	0	0.0
	135	138	14.57	14.93	0-1	0.0
	270	0	14.14	14.94		0.0
DFT-s-OFDM 16QAM	1	1	13.68	14.51	0-1	0.0
CP-OFDM QPSK	1	1	13.62	14.76	0-1.5	0.0

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Table 10-58
NR Band n77 Antenna F Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot)
and/or ECI = 3 (Earjack) - 100 MHz Bandwidth

NR Band n77 100 MHz Bandwidth						
Modulation	RB Size	RB Offset	Channel		MPR Allowed per 3GPP [dB]	MPR [dB]
			650000 (3750 MHz)	662000 (3930 MHz)		
			Conducted Power [dBm]			
DFT-s-OFDM QPSK	1	1	14.62	15.72	0	0.0
	1	137	15.22	15.98		0.0
	1	271	15.61	15.92		0.0
	135	0	14.97	15.93	0-1	0.0
	135	69	15.28	15.97	0	0.0
	135	138	15.52	15.95	0-1	0.0
	270	0	15.18	15.92		0.0
DFT-s-OFDM 16QAM	1	1	14.62	15.52	0-1	0.0
CP-OFDM QPSK	1	1	14.65	15.77	0-1.5	0.0

10.4.14 NR Band n77 Antenna E, H, G

Table 10-59
NR Band n77 Antenna E, H, G Measured P_{limit} For ECI = 1 (Head) – 100 MHz Bandwidth

NR Band n77 100 MHz Bandwidth		
Channel		
Antenna	650000 (3750 MHz)	662000 (3930 MHz)
	Conducted Power [dBm]	
SRS #1 Ant E	12.42	12.53
SRS #2 Ant H	7.93	8.56
SRS #3 Ant G	9.82	10.44

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Table 10-60
NR Band n77 Antenna E, H, G Measured P_{limit} For ECI = 4 (Body-worn or Phablet) and/or ECI = 2 (Hotspot) and/or ECI = 3 (Earjack) – 100 MHz Bandwidth

NR Band n77 100 MHz Bandwidth		
Channel		
Antenna	650000 (3750 MHz)	662000 (3930 MHz)
	Conducted Power [dBm]	
SRS #1 Ant E	13.47	13.54
SRS #2 Ant H	8.24	8.87
SRS #3 Ant G	10.83	11.42



Figure 10-4
Power Measurement Setup – NR FDD

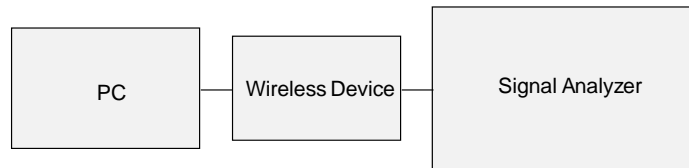


Figure 10-5
Power Measurement Setup – NR TDD

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10.5 WLAN Conducted Powers

Table 10-61
2.4 GHz WLAN Measured P_{limit} For ECI = 1 (head)

2.4GHz WIFI (20MHz 802.11b)			
Freq. [MHz]	Channel	Detector	Conducted Power [dBm]
2412	1	Average	13.77
2437	6		13.92
2462	11		13.83
2.4GHz WIFI (20MHz 802.11g)			
Freq. [MHz]	Channel	Detector	Conducted Power [dBm]
2412	1	Average	13.69
2437	6		13.72
2462	11		13.77
2.4GHz WIFI (20MHz 802.11n)			
Freq. [MHz]	Channel	Detector	Conducted Power [dBm]
2412	1	Average	13.68
2437	6		13.71
2462	11		13.65

Table 10-62
2.4 GHz WLAN Measured P_{max} For ECI = 0 (Body-worn or Phablet, Hotspot, Earjack)

2.4GHz WIFI (20MHz 802.11b)			
Freq. [MHz]	Channel	Detector	Conducted Power [dBm]
2412	1	Average	20.50
2437	6		20.87
2462	11		20.62
2.4GHz WIFI (20MHz 802.11g)			
Freq. [MHz]	Channel	Detector	Conducted Power [dBm]
2412	1	Average	19.47
2437	6		19.84
2462	11		19.60
2.4GHz WIFI (20MHz 802.11n)			
Freq. [MHz]	Channel	Detector	Conducted Power [dBm]
2412	1	Average	19.92
2437	6		19.74
2462	11		19.58

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Table 10-63
5 GHz WLAN Measured P_{limit} For ECI = 1 (Head)

5GHz WIFI (80MHz 802.11ac)			
Band	Freq. [MHz]	Channel	Avg. Conducted Power [dBm]
UNII-1	5210	42	12.70
UNII-2A	5290	58	12.85
UNII-2C	5530	106	12.92
	5610	122	12.88
	5690	138	12.71
UNII-3	5775	155	12.75

Table 10-64
5 GHz WLAN Measured P_{limit} For ECI = 0 (Body-worn or Phablet, Hotspot, Earjack)

5GHz WIFI (40MHz 802.11n)				5GHz WIFI (40MHz 802.11ac)			
Band	Freq. [MHz]	Channel	Avg. Conducted Power [dBm]	Band	Freq. [MHz]	Channel	Avg. Conducted Power [dBm]
UNII-1	5190	38	14.66	UNII-1	5190	38	14.58
	5230	46	14.78		5230	46	14.52
UNII-2A	5270	54	14.72	UNII-2A	5270	54	14.67
	5310	62	14.80		5310	62	14.70
UNII-2C	5510	102	14.66	UNII-2C	5510	102	14.62
	5590	118	14.75		5590	118	14.57
	5630	126	14.74		5630	126	14.75
	5710	142	14.78		5710	142	14.52
UNII-3	5755	151	14.70	UNII-3	5755	151	14.55
	5795	159	14.80		5795	159	14.60

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:

- Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
- For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
- For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
- For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For configurations with multiple mid-band channels, due to an even number of channels, both channels were measured.

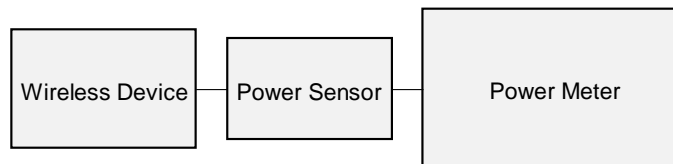


Figure 10-6
Power Measurement Setup

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10.6 Bluetooth Conducted Powers

Table 10-65
Bluetooth Maximum Average RF Power

Frequency [MHz]	Data Rate [Mbps]	Mod.	Power Scheme	Channel No.	Avg Conducted Power	
					[dBm]	[mW]
2402	1.0	GFSK	ePA	0	9.94	9.863
2441	1.0	GFSK	ePA	39	9.00	7.943
2480	1.0	GFSK	ePA	78	9.65	9.226

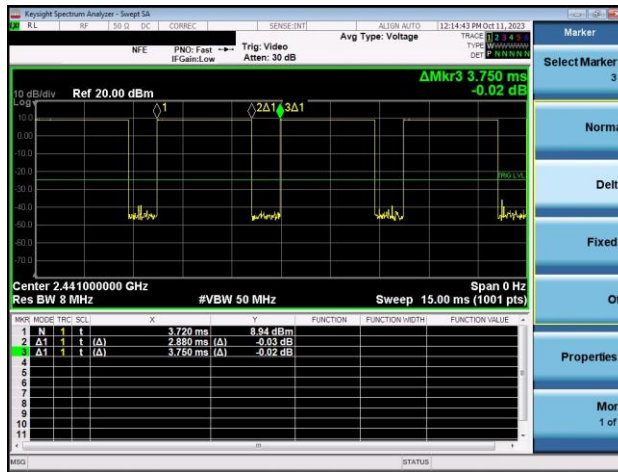


Figure 10-7
Bluetooth Transmission Plot

Equation 10-1
Bluetooth Duty Cycle Calculation

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.880ms}{3.750ms} * 100\% = 76.80\%$$

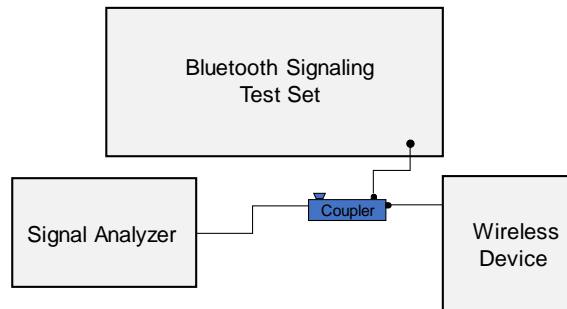


Figure 10-8
Power Measurement Setup

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11 SYSTEM VERIFICATION

11.1 Tissue Verification

**Table 11-1
Measured Head Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
10/14/2023	30 Head	23.0	12	0.725	52.988	0.750	55.000	-3.33%	-3.66%
			13	0.725	53.159	0.750	55.000	-3.33%	-3.35%
			14	0.726	53.302	0.750	55.000	-3.20%	-3.09%
09/12/2023	750 Head	19.8	680	0.881	40.672	0.888	42.305	-0.79%	-3.86%
			695	0.887	40.631	0.889	42.227	-0.22%	-3.78%
			700	0.888	40.620	0.889	42.201	-0.11%	-3.75%
			710	0.892	40.596	0.890	42.149	0.22%	-3.68%
			725	0.897	40.556	0.891	42.071	0.67%	-3.60%
			750	0.906	40.477	0.894	41.942	1.34%	-3.49%
			770	0.913	40.414	0.895	41.838	2.01%	-3.40%
			785	0.919	40.369	0.896	41.760	2.57%	-3.33%
09/12/2023	750 Head	21.5	680	0.859	43.639	0.888	42.305	-3.27%	3.15%
			695	0.864	43.598	0.889	42.227	-2.81%	3.25%
			700	0.866	43.588	0.889	42.201	-2.59%	3.29%
			710	0.869	43.563	0.890	42.149	-2.36%	3.35%
			725	0.875	43.523	0.891	42.071	-1.80%	3.45%
			750	0.883	43.450	0.894	41.942	-1.23%	3.60%
			770	0.891	43.389	0.895	41.838	-0.45%	3.71%
			785	0.896	43.341	0.896	41.760	0.00%	3.79%
09/20/2023	750 Head	20.1	680	0.892	41.162	0.888	42.305	0.45%	-2.70%
			695	0.897	41.126	0.889	42.227	0.90%	-2.61%
			700	0.899	41.113	0.889	42.201	1.12%	-2.58%
			710	0.902	41.080	0.890	42.149	1.35%	-2.54%
			725	0.908	41.026	0.891	42.071	1.91%	-2.48%
			750	0.918	40.931	0.894	41.942	2.68%	-2.41%
			770	0.925	40.869	0.895	41.838	3.35%	-2.32%
			785	0.930	40.829	0.896	41.760	3.79%	-2.23%
10/02/2023	750 Head	21.2	680	0.869	41.644	0.888	42.305	-2.14%	-1.56%
			695	0.874	41.602	0.889	42.227	-1.69%	-1.48%
			700	0.875	41.589	0.889	42.201	-1.57%	-1.45%
			710	0.879	41.562	0.890	42.149	-1.24%	-1.39%
			725	0.884	41.523	0.891	42.071	-0.79%	-1.30%
			750	0.892	41.447	0.894	41.942	-0.22%	-1.18%
			770	0.898	41.395	0.895	41.838	0.34%	-1.06%
			785	0.903	41.359	0.896	41.760	0.78%	-0.96%
10/04/2023	750 Head	21.0	680	0.854	42.118	0.888	42.305	-3.83%	-0.44%
			695	0.860	42.075	0.889	42.227	-3.26%	-0.36%
			700	0.861	42.062	0.889	42.201	-3.15%	-0.33%
			710	0.865	42.034	0.890	42.149	-2.81%	-0.27%
			725	0.870	41.983	0.891	42.071	-2.36%	-0.21%
			750	0.878	41.891	0.894	41.942	-1.79%	-0.12%
			770	0.884	41.847	0.895	41.838	-1.23%	0.02%
			785	0.889	41.812	0.896	41.760	-0.78%	0.12%
09/13/2023	835 Head	21.2	815	0.866	43.229	0.898	41.594	-3.56%	3.93%
			820	0.867	43.212	0.899	41.578	-3.56%	3.93%
			835	0.872	43.169	0.900	41.500	-3.11%	4.02%
			850	0.876	43.135	0.916	41.500	-4.37%	3.94%

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**Table 11-2
Measured Head Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
09/25/2023	835 Head	22.3	815	0.855	40.273	0.898	41.594	-4.79%	-3.18%
			820	0.860	40.203	0.899	41.578	-4.34%	-3.31%
			835	0.874	39.994	0.900	41.500	-2.89%	-3.63%
			850	0.888	39.803	0.916	41.500	-3.06%	-4.09%
10/04/2023	835 Head	23.5	815	0.919	40.986	0.898	41.594	2.34%	-1.46%
			820	0.921	40.969	0.899	41.578	2.45%	-1.46%
			835	0.925	40.919	0.900	41.500	2.78%	-1.40%
			850	0.929	40.886	0.916	41.500	1.42%	-1.48%
10/18/2023	835 Head	21.2	815	0.896	41.280	0.898	41.594	-0.22%	-0.75%
			820	0.898	41.263	0.899	41.578	-0.11%	-0.76%
			835	0.903	41.215	0.900	41.500	0.33%	-0.69%
			850	0.908	41.180	0.916	41.500	-0.87%	-0.77%
09/18/2023	1750 Head	19.5	1700	1.350	41.609	1.343	40.145	0.53%	3.64%
			1705	1.353	41.601	1.345	40.141	0.53%	3.64%
			1710	1.355	41.594	1.348	40.136	0.52%	3.63%
			1720	1.361	41.576	1.354	40.126	0.52%	3.61%
			1745	1.376	41.532	1.368	40.087	0.58%	3.60%
			1750	1.379	41.526	1.371	40.079	0.58%	3.61%
			1770	1.392	41.503	1.383	40.047	0.65%	3.64%
			1790	1.404	41.477	1.394	40.016	0.72%	3.65%
09/20/2023	1750 Head	22.3	1700	1.370	40.636	1.343	40.145	1.99%	1.22%
			1705	1.372	40.626	1.345	40.141	2.00%	1.21%
			1710	1.375	40.618	1.348	40.136	2.00%	1.20%
			1720	1.381	40.597	1.354	40.126	1.99%	1.17%
			1745	1.397	40.555	1.368	40.087	2.12%	1.17%
			1750	1.401	40.547	1.371	40.079	2.19%	1.17%
			1770	1.413	40.518	1.383	40.047	2.17%	1.18%
			1790	1.426	40.481	1.394	40.016	2.30%	1.16%
10/02/2023	1750 Head	21.5	1710	1.375	39.006	1.348	40.142	2.00%	-2.83%
			1720	1.384	38.965	1.354	40.126	2.22%	-2.89%
			1745	1.406	38.850	1.368	40.087	2.78%	-3.09%
			1750	1.410	38.828	1.371	40.079	2.84%	-3.12%
			1770	1.429	38.746	1.383	40.047	3.33%	-3.25%
			1790	1.447	38.672	1.394	40.016	3.80%	-3.36%
10/04/2023	1750 Head	20.2	1710	1.376	39.478	1.348	40.142	2.08%	-1.65%
			1720	1.385	39.435	1.354	40.126	2.29%	-1.72%
			1745	1.407	39.340	1.368	40.087	2.85%	-1.86%
			1750	1.411	39.319	1.371	40.079	2.92%	-1.90%
			1770	1.430	39.227	1.383	40.047	3.40%	-2.05%
			1790	1.450	39.132	1.394	40.016	4.02%	-2.21%
10/17/2023	1750 Head	21.5	1710	1.312	39.970	1.348	40.142	-2.67%	-0.43%
			1720	1.318	39.951	1.354	40.126	-2.66%	-0.44%
			1745	1.334	39.907	1.368	40.087	-2.49%	-0.45%
			1750	1.337	39.899	1.371	40.079	-2.48%	-0.45%
			1770	1.349	39.867	1.383	40.047	-2.46%	-0.45%
			1790	1.360	39.839	1.394	40.016	-2.44%	-0.44%
10/23/2023	1750 Head	20.8	1710	1.291	39.193	1.348	40.142	-4.23%	-2.36%
			1720	1.297	39.174	1.354	40.126	-4.21%	-2.37%
			1745	1.313	39.131	1.368	40.087	-4.02%	-2.38%
			1750	1.316	39.124	1.371	40.079	-4.01%	-2.38%
			1770	1.329	39.104	1.383	40.047	-3.90%	-2.35%
			1790	1.339	39.082	1.394	40.016	-3.95%	-2.33%

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**Table 11-3
Measured Head Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
09/11/2023	1900 Head	21.8	1850	1.342	39.182	1.400	40.000	-4.14%	-2.04%
			1860	1.348	39.170	1.400	40.000	-3.71%	-2.08%
			1880	1.359	39.157	1.400	40.000	-2.93%	-2.11%
			1900	1.371	39.145	1.400	40.000	-2.07%	-2.14%
			1905	1.374	39.140	1.400	40.000	-1.86%	-2.15%
			1910	1.377	39.135	1.400	40.000	-1.64%	-2.16%
			1920	1.384	39.124	1.400	40.000	-1.14%	-2.19%
09/11/2023	1900 Head	23.4	1850	1.389	40.431	1.400	40.000	-0.79%	1.08%
			1860	1.399	40.396	1.400	40.000	-0.07%	0.99%
			1880	1.418	40.328	1.400	40.000	1.29%	0.82%
			1900	1.436	40.250	1.400	40.000	2.57%	0.63%
			1905	1.440	40.229	1.400	40.000	2.86%	0.57%
			1910	1.445	40.209	1.400	40.000	3.21%	0.52%
			1920	1.455	40.167	1.400	40.000	3.93%	0.42%
09/18/2023	1900 Head	21.4	1850	1.384	41.485	1.400	40.000	-1.14%	3.71%
			1860	1.395	41.438	1.400	40.000	-0.36%	3.60%
			1880	1.420	41.352	1.400	40.000	1.43%	3.38%
			1900	1.443	41.283	1.400	40.000	3.07%	3.21%
			1905	1.448	41.268	1.400	40.000	3.43%	3.17%
			1910	1.454	41.252	1.400	40.000	3.86%	3.13%
			1920	1.465	41.209	1.400	40.000	4.64%	3.57%
09/20/2023	1900 Head	21.3	1850	1.401	41.645	1.400	40.000	0.07%	4.11%
			1860	1.412	41.607	1.400	40.000	0.86%	4.02%
			1880	1.433	41.533	1.400	40.000	2.36%	3.83%
			1900	1.454	41.464	1.400	40.000	3.86%	3.66%
			1905	1.459	41.446	1.400	40.000	4.21%	3.61%
			1910	1.465	41.429	1.400	40.000	4.64%	3.57%
			1920	1.476	41.386	1.400	40.000	5.43%	3.47%
10/02/2023	1900 Head	23.7	1850	1.366	38.657	1.400	40.000	-2.43%	-3.36%
			1860	1.375	38.625	1.400	40.000	-1.79%	-3.44%
			1880	1.393	38.571	1.400	40.000	-0.50%	-3.57%
			1900	1.412	38.502	1.400	40.000	0.86%	-3.74%
			1905	1.417	38.484	1.400	40.000	1.21%	-3.79%
			1910	1.421	38.462	1.400	40.000	1.50%	-3.84%
			1920	1.430	38.417	1.400	40.000	2.14%	-3.96%
10/05/2023	1900 Head	22.6	1850	1.392	38.861	1.400	40.000	-0.57%	-2.85%
			1860	1.400	38.823	1.400	40.000	0.00%	-2.94%
			1880	1.419	38.746	1.400	40.000	1.36%	-3.13%
			1900	1.438	38.674	1.400	40.000	2.71%	-3.32%
			1905	1.443	38.654	1.400	40.000	3.07%	-3.36%
			1910	1.448	38.634	1.400	40.000	3.43%	-3.42%
			1920	1.456	38.592	1.400	40.000	4.00%	-3.52%
10/09/2023	1900 Head	20.3	1850	1.381	39.511	1.400	40.000	-1.36%	-1.22%
			1860	1.392	39.471	1.400	40.000	-0.57%	-1.32%
			1880	1.414	39.403	1.400	40.000	1.00%	-1.49%
			1900	1.434	39.341	1.400	40.000	2.43%	-1.65%
			1905	1.438	39.323	1.400	40.000	2.71%	-1.69%
			1910	1.443	39.303	1.400	40.000	3.07%	-1.74%
			1920	1.452	39.258	1.400	40.000	3.71%	-1.85%
10/11/2023	1900 Head	23.2	1850	1.332	39.320	1.400	40.000	-4.86%	-1.70%
			1860	1.343	39.273	1.400	40.000	-4.07%	-1.82%
			1880	1.366	39.185	1.400	40.000	-2.43%	-2.04%
			1900	1.388	39.121	1.400	40.000	-0.86%	-2.20%
			1905	1.393	39.106	1.400	40.000	-0.50%	-2.24%
			1910	1.398	39.091	1.400	40.000	-0.14%	-2.27%
			1920	1.407	39.060	1.400	40.000	0.50%	-2.35%

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**Table 11-4
Measured Head Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
10/18/2023	1900 Head	23.6	1850	1.375	40.514	1.400	40.000	-1.79%	1.29%
			1860	1.385	40.477	1.400	40.000	-1.07%	1.19%
			1880	1.406	40.404	1.400	40.000	0.43%	1.01%
			1900	1.427	40.333	1.400	40.000	1.93%	0.83%
			1905	1.433	40.313	1.400	40.000	2.36%	0.78%
			1910	1.438	40.293	1.400	40.000	2.71%	0.73%
10/25/2023	1900 Head	19.6	1920	1.449	40.249	1.400	40.000	3.50%	0.62%
			1850	1.389	38.377	1.400	40.000	-0.79%	-4.06%
			1860	1.395	38.359	1.400	40.000	-0.36%	-4.10%
			1880	1.409	38.338	1.400	40.000	0.64%	-4.16%
			1900	1.422	38.327	1.400	40.000	1.57%	-4.18%
			1905	1.425	38.325	1.400	40.000	1.79%	-4.19%
10/04/2023	2450 Head	25.0	1910	1.428	38.322	1.400	40.000	2.00%	-4.19%
			1920	1.433	38.314	1.400	40.000	2.36%	-4.22%
			2300	1.677	41.088	1.670	39.500	0.42%	4.02%
			2310	1.688	41.052	1.679	39.480	0.54%	3.98%
			2320	1.699	41.014	1.687	39.460	0.71%	3.94%
			2400	1.794	40.721	1.756	39.289	2.16%	3.64%
			2450	1.853	40.509	1.800	39.200	2.94%	3.34%
			2480	1.890	40.406	1.833	39.162	3.11%	3.18%
			2500	1.914	40.336	1.855	39.136	3.18%	3.07%
			2510	1.925	40.297	1.866	39.123	3.16%	3.00%
			2535	1.954	40.182	1.893	39.092	3.22%	2.79%
			2550	1.973	40.115	1.909	39.073	3.35%	2.67%
			2560	1.986	40.076	1.920	39.060	3.44%	2.60%
			2600	2.035	39.930	1.964	39.009	3.62%	2.36%
10/04/2023	2450 Head	20.2	2650	2.094	39.714	2.018	38.945	3.77%	1.97%
			2680	2.131	39.581	2.051	38.907	3.90%	1.73%
			2700	2.156	39.502	2.073	38.882	4.00%	1.59%
			2300	1.717	38.815	1.670	39.500	2.81%	-1.73%
			2310	1.725	38.798	1.679	39.480	2.74%	-1.73%
			2320	1.732	38.783	1.687	39.460	2.67%	-1.72%
			2400	1.794	38.646	1.756	39.289	2.16%	-1.64%
			2450	1.834	38.547	1.800	39.200	1.89%	-1.67%
			2480	1.857	38.490	1.833	39.162	1.31%	-1.72%
			2500	1.873	38.454	1.855	39.136	0.97%	-1.74%
			2510	1.880	38.436	1.866	39.123	0.75%	-1.76%
			2535	1.900	38.382	1.893	39.092	0.37%	-1.82%
			2550	1.912	38.349	1.909	39.073	0.16%	-1.85%
			2560	1.920	38.326	1.920	39.060	0.00%	-1.88%
10/11/2023	2450 Head	21.5	2600	1.952	38.267	1.964	39.009	-0.61%	-1.90%
			2650	1.991	38.156	2.018	38.945	-1.34%	-2.03%
			2680	2.017	38.105	2.051	38.907	-1.66%	-2.06%
			2700	2.033	38.088	2.073	38.882	-1.93%	-2.04%
			2300	1.699	39.164	1.670	39.500	1.74%	-0.85%
			2310	1.707	39.153	1.679	39.480	1.67%	-0.83%
			2320	1.714	39.144	1.687	39.460	1.60%	-0.80%
			2400	1.772	39.022	1.756	39.289	0.91%	-0.68%
			2450	1.809	38.951	1.800	39.200	0.50%	-0.64%
			2480	1.831	38.914	1.833	39.162	-0.11%	-0.63%
			2500	1.847	38.880	1.855	39.136	-0.43%	-0.65%
			2510	1.855	38.859	1.866	39.123	-0.59%	-0.67%
			2535	1.876	38.801	1.893	39.092	-0.90%	-0.74%
			2550	1.889	38.779	1.909	39.073	-1.05%	-0.75%
2560	1.896	38.767	1.920	39.060	-1.25%	-0.75%			
2600	1.926	38.723	1.964	39.009	-1.93%	-0.73%			
2650	1.966	38.592	2.018	38.945	-2.58%	-0.91%			
2680	1.991	38.559	2.051	38.907	-2.93%	-0.89%			
2700	2.005	38.551	2.073	38.882	-3.28%	-0.85%			

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**Table 11-5
Measured Head Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
10/18/2023	2450 Head	20.0	2300	1.698	38.091	1.670	39.500	1.68%	-3.57%
			2310	1.707	38.078	1.679	39.480	1.67%	-3.55%
			2320	1.716	38.062	1.687	39.460	1.72%	-3.54%
			2400	1.777	37.935	1.756	39.289	1.20%	-3.45%
			2450	1.820	37.848	1.800	39.200	1.11%	-3.45%
			2480	1.841	37.825	1.833	39.162	0.44%	-3.41%
			2500	1.855	37.797	1.855	39.136	0.00%	-3.42%
			2510	1.863	37.777	1.866	39.123	-0.16%	-3.44%
			2535	1.885	37.719	1.893	39.092	-0.42%	-3.51%
			2550	1.898	37.699	1.909	39.073	-0.58%	-3.52%
			2560	1.907	37.694	1.920	39.060	-0.68%	-3.50%
			2600	1.934	37.654	1.964	39.009	-1.53%	-3.47%
			2650	1.977	37.536	2.018	38.945	-2.03%	-3.62%
10/20/2023	2450 Head	20.8	2300	1.688	37.835	1.670	39.500	1.08%	-4.22%
			2310	1.695	37.819	1.679	39.480	0.95%	-4.21%
			2320	1.703	37.801	1.687	39.460	0.95%	-4.20%
			2400	1.763	37.660	1.756	39.289	0.40%	-4.15%
			2450	1.800	37.566	1.800	39.200	0.00%	-4.17%
			2480	1.823	37.514	1.833	39.162	-0.55%	-4.21%
			2500	1.840	37.470	1.855	39.136	-0.81%	-4.26%
			2510	1.848	37.446	1.866	39.123	-0.96%	-4.29%
			2535	1.867	37.396	1.893	39.092	-1.37%	-4.34%
			2550	1.879	37.371	1.909	39.073	-1.57%	-4.36%
			2560	1.887	37.356	1.920	39.060	-1.72%	-4.36%
			2600	1.918	37.268	1.964	39.009	-2.34%	-4.46%
			2650	1.956	37.154	2.018	38.945	-3.07%	-4.60%
10/23/2023	2450 Head	21.3	2300	1.705	38.507	1.670	39.500	2.10%	-2.51%
			2310	1.713	38.505	1.679	39.480	2.03%	-2.47%
			2320	1.721	38.498	1.687	39.460	2.02%	-2.44%
			2400	1.781	38.375	1.756	39.289	1.42%	-2.33%
			2450	1.820	38.316	1.800	39.200	1.11%	-2.26%
			2480	1.843	38.257	1.833	39.162	0.55%	-2.31%
			2500	1.860	38.205	1.855	39.136	0.27%	-2.38%
			2510	1.868	38.184	1.866	39.123	0.11%	-2.40%
			2535	1.887	38.151	1.893	39.092	-0.32%	-2.41%
			2550	1.897	38.137	1.909	39.073	-0.63%	-2.40%
			2560	1.904	38.124	1.920	39.060	-0.83%	-2.40%
			2600	1.937	38.028	1.964	39.009	-1.37%	-2.51%
			2650	1.977	37.962	2.018	38.945	-2.03%	-2.52%
10/27/2023	2450 Head	19.2	2300	1.728	39.441	1.670	39.500	3.47%	-0.15%
			2310	1.737	39.434	1.679	39.480	3.45%	-0.12%
			2320	1.748	39.429	1.687	39.460	3.62%	-0.08%
			2400	1.816	39.282	1.756	39.289	3.42%	-0.02%
			2450	1.860	39.201	1.800	39.200	3.33%	0.00%
			2480	1.884	39.138	1.833	39.162	2.78%	-0.06%
			2500	1.900	39.072	1.855	39.136	2.43%	-0.16%
			2510	1.907	39.041	1.866	39.123	2.20%	-0.21%
			2535	1.928	39.004	1.893	39.092	1.85%	-0.23%
			2550	1.941	38.998	1.909	39.073	1.68%	-0.19%
			2560	1.950	38.990	1.920	39.060	1.56%	-0.18%
			2600	1.979	38.892	1.964	39.009	0.76%	-0.30%
			2650	2.022	38.807	2.018	38.945	0.20%	-0.35%
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**Table 11-6
Measured Head Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
10/28/2023	2450 Head	23.6	2300	1.753	38.468	1.670	39.500	4.97%	-2.61%
			2310	1.761	38.454	1.679	39.480	4.88%	-2.60%
			2320	1.768	38.440	1.687	39.460	4.80%	-2.58%
			2400	1.827	38.322	1.756	39.289	4.04%	-2.46%
			2450	1.866	38.232	1.800	39.200	3.67%	-2.47%
			2480	1.889	38.187	1.833	39.162	3.06%	-2.49%
			2500	1.903	38.157	1.855	39.136	2.59%	-2.50%
			2510	1.911	38.137	1.866	39.123	2.41%	-2.52%
			2535	1.931	38.083	1.893	39.092	2.01%	-2.58%
			2550	1.944	38.056	1.909	39.073	1.83%	-2.60%
			2560	1.952	38.039	1.920	39.060	1.67%	-2.61%
			2600	1.983	37.987	1.964	39.009	0.97%	-2.62%
			2650	2.020	37.866	2.018	38.945	0.10%	-2.77%
			2680	2.048	37.818	2.051	38.907	-0.15%	-2.80%
2700	2.063	37.802	2.073	38.882	-0.48%	-2.78%			
10/05/2023	3600 Head	19.0	3300	2.627	38.985	2.708	38.157	-2.99%	2.17%
			3350	2.675	38.905	2.759	38.100	-3.04%	2.11%
			3450	2.772	38.709	2.861	37.986	-3.11%	1.90%
			3500	2.811	38.639	2.913	37.929	-3.50%	1.87%
			3550	2.866	38.547	2.964	37.871	-3.31%	1.79%
			3560	2.875	38.517	2.974	37.860	-3.33%	1.74%
			3600	2.909	38.474	3.015	37.814	-3.52%	1.75%
			3650	2.962	38.388	3.066	37.757	-3.39%	1.67%
			3690	3.001	38.288	3.107	37.711	-3.41%	1.53%
			3700	3.009	38.276	3.117	37.700	-3.46%	1.53%
			3750	3.062	38.246	3.169	37.643	-3.38%	1.60%
			3900	3.217	37.992	3.323	37.471	-3.19%	1.39%
			3930	3.250	37.875	3.353	37.437	-3.07%	1.17%
			4100	3.445	37.660	3.528	37.243	-2.35%	1.12%
4150	3.488	37.524	3.579	37.186	-2.54%	0.91%			
10/05/2023	3600 Head	21.1	3300	2.765	37.432	2.708	38.157	2.10%	-1.90%
			3350	2.797	37.364	2.759	38.100	1.38%	-1.93%
			3450	2.872	37.225	2.861	37.986	0.38%	-2.00%
			3500	2.917	37.130	2.913	37.929	0.14%	-2.11%
			3550	2.952	37.082	2.964	37.871	-0.40%	-2.08%
			3560	2.959	37.068	2.974	37.860	-0.50%	-2.09%
			3600	2.998	37.009	3.015	37.814	-0.56%	-2.13%
			3650	3.030	36.955	3.066	37.757	-1.17%	-2.12%
			3690	3.069	36.890	3.107	37.711	-1.22%	-2.18%
			3700	3.074	36.888	3.117	37.700	-1.38%	-2.15%
			3750	3.110	36.822	3.169	37.643	-1.86%	-2.18%
			3900	3.236	36.651	3.323	37.471	-2.62%	-2.19%
			3930	3.261	36.611	3.353	37.437	-2.74%	-2.21%
			4100	3.415	36.410	3.528	37.243	-3.20%	-2.24%
4150	3.461	36.320	3.579	37.186	-3.30%	-2.33%			
10/09/2023	3600 Head	20.3	3300	2.781	36.713	2.708	38.157	2.70%	-3.78%
			3350	2.820	36.646	2.759	38.100	2.21%	-3.82%
			3450	2.891	36.493	2.861	37.986	1.05%	-3.93%
			3500	2.928	36.434	2.913	37.929	0.51%	-3.94%
			3550	2.969	36.377	2.964	37.871	0.17%	-3.94%
			3560	2.976	36.364	2.974	37.860	0.07%	-3.95%
			3600	3.008	36.313	3.015	37.814	-0.23%	-3.97%
			3650	3.044	36.256	3.066	37.757	-0.72%	-3.98%
			3690	3.075	36.196	3.107	37.711	-1.03%	-4.02%
			3700	3.085	36.182	3.117	37.700	-1.03%	-4.03%
			3750	3.123	36.148	3.169	37.643	-1.45%	-3.97%
			3900	3.244	35.960	3.323	37.471	-2.38%	-4.03%
			3930	3.273	35.929	3.353	37.437	-2.39%	-4.03%
			4100	3.421	35.740	3.528	37.243	-3.03%	-4.04%
4150	3.464	35.670	3.579	37.186	-3.21%	-4.08%			

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**Table 11-7
Measured Head Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ			
10/11/2023	3600 Head	21.3	3300	2.742	37.642	2.708	38.157	1.26%	-1.35%			
			3350	2.780	37.611	2.759	38.100	0.76%	-1.28%			
			3450	2.855	37.458	2.861	37.986	-0.21%	-1.39%			
			3500	2.892	37.355	2.913	37.929	-0.72%	-1.51%			
			3550	2.930	37.335	2.964	37.871	-1.15%	-1.42%			
			3560	2.936	37.323	2.974	37.860	-1.28%	-1.42%			
			3600	2.972	37.233	3.015	37.814	-1.43%	-1.54%			
			3650	3.006	37.207	3.066	37.757	-1.96%	-1.46%			
			3690	3.041	37.122	3.107	37.711	-2.12%	-1.56%			
			3700	3.050	37.111	3.117	37.700	-2.15%	-1.56%			
			3750	3.083	37.080	3.169	37.643	-2.71%	-1.50%			
			3900	3.215	36.891	3.323	37.471	-3.25%	-1.55%			
			3930	3.232	36.867	3.353	37.437	-3.61%	-1.52%			
			4100	3.391	36.682	3.528	37.243	-3.88%	-1.51%			
			4150	3.420	36.577	3.579	37.186	-4.44%	-1.64%			
			3300	2.638	39.007	2.708	38.157	-2.58%	2.23%			
			10/23/2023	3600 Head	20.2	3350	2.681	38.936	2.759	38.100	-2.83%	2.19%
3450	2.774	38.740				2.861	37.986	-3.04%	1.98%			
3500	2.823	38.636				2.913	37.929	-3.09%	1.86%			
3550	2.868	38.559				2.964	37.871	-3.24%	1.82%			
3560	2.879	38.533				2.974	37.860	-3.19%	1.78%			
3600	2.922	38.463				3.015	37.814	-3.08%	1.72%			
3650	2.965	38.391				3.066	37.757	-3.29%	1.68%			
3690	3.006	38.323				3.107	37.711	-3.25%	1.62%			
3700	3.015	38.314				3.117	37.700	-3.27%	1.63%			
3750	3.063	38.224				3.169	37.643	-3.34%	1.54%			
3900	3.219	37.994				3.323	37.471	-3.13%	1.40%			
3930	3.251	37.929				3.353	37.437	-3.04%	1.31%			
4100	3.437	37.631				3.528	37.243	-2.58%	1.04%			
4150	3.487	37.525				3.579	37.186	-2.57%	0.91%			
10/07/2023	5200-5800 Head	21.5				5180	4.520	35.658	4.635	36.009	-2.48%	-0.97%
						5190	4.536	35.640	4.645	35.998	-2.35%	-0.99%
						5200	4.549	35.634	4.655	35.986	-2.28%	-0.98%
			5210	4.560	35.626	4.666	35.975	-2.27%	-0.97%			
			5220	4.568	35.617	4.676	35.963	-2.31%	-0.96%			
			5240	4.585	35.577	4.696	35.940	-2.36%	-1.01%			
			5250	4.596	35.549	4.706	35.929	-2.34%	-1.06%			
			5260	4.606	35.521	4.717	35.917	-2.35%	-1.10%			
			5270	4.617	35.493	4.727	35.906	-2.33%	-1.15%			
			5280	4.631	35.474	4.737	35.894	-2.24%	-1.17%			
			5290	4.645	35.459	4.748	35.883	-2.17%	-1.18%			
			5300	4.659	35.444	4.758	35.871	-2.08%	-1.19%			
			5310	4.669	35.430	4.768	35.860	-2.08%	-1.20%			
			5320	4.678	35.420	4.778	35.849	-2.09%	-1.20%			
			5500	4.878	35.129	4.963	35.643	-1.71%	-1.44%			
			5510	4.883	35.107	4.973	35.632	-1.81%	-1.47%			
			5520	4.890	35.088	4.983	35.620	-1.87%	-1.49%			
			5530	4.899	35.058	4.994	35.609	-1.90%	-1.55%			
			5540	4.913	35.022	5.004	35.597	-1.82%	-1.62%			
			5550	4.929	34.986	5.014	35.586	-1.70%	-1.69%			
			5560	4.949	34.968	5.024	35.574	-1.49%	-1.70%			
			5580	4.983	34.956	5.045	35.551	-1.23%	-1.67%			
			5600	5.001	34.936	5.065	35.529	-1.26%	-1.67%			
			5610	5.009	34.932	5.076	35.518	-1.32%	-1.65%			
			5620	5.016	34.914	5.086	35.506	-1.38%	-1.67%			
			5640	5.034	34.853	5.106	35.483	-1.41%	-1.78%			
			5660	5.064	34.785	5.127	35.460	-1.23%	-1.90%			
			5670	5.082	34.769	5.137	35.449	-1.07%	-1.92%			
			5680	5.100	34.762	5.147	35.437	-0.91%	-1.90%			
			5690	5.115	34.759	5.158	35.426	-0.83%	-1.88%			
			5700	5.126	34.759	5.168	35.414	-0.81%	-1.85%			
			5710	5.135	34.752	5.178	35.403	-0.83%	-1.84%			
			5720	5.143	34.750	5.188	35.391	-0.87%	-1.81%			
			5745	5.162	34.706	5.214	35.363	-1.00%	-1.86%			
			5750	5.166	34.690	5.219	35.357	-1.02%	-1.89%			
			5755	5.170	34.675	5.224	35.351	-1.03%	-1.91%			
			5765	5.181	34.644	5.234	35.340	-1.01%	-1.97%			
			5775	5.197	34.617	5.245	35.329	-0.92%	-2.02%			
			5785	5.216	34.591	5.255	35.317	-0.74%	-2.06%			
			5795	5.230	34.575	5.265	35.305	-0.66%	-2.07%			
5805	5.242	34.571	5.275	35.294	-0.63%	-2.05%						
5825	5.266	34.550	5.296	35.271	-0.57%	-2.04%						
5835	5.279	34.529	5.305	35.230	-0.49%	-1.99%						
5845	5.285	34.514	5.315	35.210	-0.56%	-1.98%						
5855	5.289	34.506	5.325	35.197	-0.68%	-1.96%						
5875	5.308	34.458	5.347	35.183	-0.73%	-2.06%						
5885	5.319	34.417	5.357	35.177	-0.71%	-2.16%						
5905	5.350	34.378	5.379	35.163	-0.54%	-2.23%						

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**Table 11-8
Measured Head Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
10/10/2023	5200-5800 Head	21.0	5180	4.420	35.445	4.635	36.009	-4.64%	-1.57%
			5190	4.431	35.426	4.645	35.998	-4.61%	-1.59%
			5200	4.442	35.409	4.655	35.986	-4.58%	-1.60%
			5210	4.452	35.383	4.666	35.975	-4.59%	-1.65%
			5220	4.464	35.357	4.676	35.963	-4.53%	-1.69%
			5240	4.489	35.326	4.696	35.940	-4.41%	-1.71%
			5250	4.501	35.314	4.706	35.929	-4.36%	-1.71%
			5260	4.513	35.300	4.717	35.917	-4.32%	-1.72%
			5270	4.524	35.283	4.727	35.906	-4.29%	-1.74%
			5280	4.533	35.265	4.737	35.894	-4.31%	-1.75%
			5290	4.545	35.253	4.748	35.883	-4.28%	-1.76%
			5300	4.556	35.238	4.758	35.871	-4.25%	-1.76%
			5310	4.570	35.219	4.768	35.860	-4.15%	-1.79%
			5320	4.581	35.194	4.778	35.849	-4.12%	-1.83%
			5500	4.782	34.903	4.963	35.643	-3.65%	-2.08%
			5510	4.796	34.889	4.973	35.632	-3.56%	-2.09%
			5520	4.809	34.862	4.983	35.620	-3.49%	-2.13%
			5530	4.819	34.838	4.994	35.609	-3.50%	-2.17%
			5540	4.828	34.819	5.004	35.597	-3.52%	-2.19%
			5550	4.842	34.797	5.014	35.586	-3.43%	-2.22%
			5560	4.859	34.772	5.024	35.574	-3.28%	-2.25%
			5580	4.885	34.758	5.045	35.551	-3.17%	-2.23%
			5600	4.908	34.720	5.065	35.529	-3.10%	-2.28%
			5610	4.921	34.694	5.076	35.518	-3.05%	-2.32%
			5620	4.934	34.677	5.086	35.506	-2.99%	-2.33%
			5640	4.957	34.640	5.106	35.483	-2.92%	-2.38%
			5660	4.981	34.597	5.127	35.460	-2.85%	-2.43%
			5670	4.992	34.585	5.137	35.449	-2.82%	-2.44%
			5680	5.005	34.570	5.147	35.437	-2.76%	-2.45%
			5690	5.016	34.551	5.158	35.426	-2.75%	-2.47%
			5700	5.028	34.528	5.168	35.414	-2.71%	-2.50%
			5710	5.041	34.510	5.178	35.403	-2.65%	-2.52%
			5720	5.054	34.495	5.188	35.391	-2.58%	-2.53%
			5745	5.079	34.434	5.214	35.363	-2.59%	-2.63%
			5750	5.084	34.422	5.219	35.357	-2.59%	-2.64%
			5755	5.090	34.409	5.224	35.351	-2.57%	-2.66%
			5765	5.105	34.392	5.234	35.340	-2.46%	-2.68%
			5775	5.120	34.381	5.245	35.329	-2.38%	-2.68%
			5785	5.131	34.367	5.255	35.317	-2.36%	-2.69%
			5795	5.140	34.346	5.265	35.305	-2.37%	-2.72%
5800	5.145	34.337	5.270	35.300	-2.37%	-2.73%			
5800	5.145	34.337	5.270	35.300	-2.37%	-2.73%			
5805	5.150	34.331	5.275	35.294	-2.37%	-2.73%			
5825	5.173	34.304	5.296	35.271	-2.32%	-2.74%			
5835	5.183	34.288	5.305	35.230	-2.30%	-2.67%			
5845	5.192	34.265	5.315	35.210	-2.31%	-2.68%			
5855	5.201	34.238	5.325	35.197	-2.33%	-2.72%			
5865	5.214	34.215	5.336	35.190	-2.29%	-2.77%			
5865	5.214	34.215	5.336	35.190	-2.29%	-2.77%			
5865	5.214	34.215	5.336	35.190	-2.29%	-2.77%			
5865	5.214	34.215	5.336	35.190	-2.29%	-2.77%			
5875	5.228	34.206	5.347	35.183	-2.23%	-2.78%			
5885	5.238	34.201	5.357	35.177	-2.22%	-2.77%			
5905	5.259	34.168	5.379	35.163	-2.23%	-2.83%			

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

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12 SAR DATA SUMMARY

12.1 GSM 850 Standalone SAR

Table 12-1

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Head	GSM 850	GSM	A	07056	1:8.3	0.04	848.80	251	33.5	32.98	Right Cheek	0	0.247	1.127	0.278	0.174	A1	28.0	28.0
Head	GSM 850	GSM	A	07056	1:8.3	-0.01	848.80	251	33.5	32.98	Right Tilt	0	0.131	1.127	0.148	0.093		30.7	
Head	GSM 850	GSM	A	07056	1:8.3	0.04	848.80	251	33.5	32.98	Left Cheek	0	0.229	1.127	0.258	0.161		28.3	
Head	GSM 850	GSM	A	07056	1:8.3	0.08	848.80	251	33.5	32.98	Left Tilt	0	0.121	1.127	0.136	0.085		31.1	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 12-2

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Body-worn	GSM 850	GSM	A	07056	1:8.3	0.00	848.80	251	33.5	32.98	Back	10	0.572	1.127	0.645	0.403	A2	24.3	24.3
Body-worn	GSM 850	GSM	A	07056	1:8.3	-0.02	848.80	251	33.5	32.98	Front	10	0.167	1.127	0.188	0.118		29.7	
Hotspot	GPRS 850	GPRS 3 Tx Slots	A	07056	1:2.76	-0.03	848.80	251	29.0	28.20	Back	10	0.515	1.202	0.619	0.387	A3	24.8	
Hotspot	GPRS 850	GPRS 3 Tx Slots	A	07056	1:2.76	0.03	848.80	251	29.0	28.20	Front	10	0.172	1.202	0.207	0.129		29.5	
Hotspot	GPRS 850	GPRS 3 Tx Slots	A	07056	1:2.76	-0.05	848.80	251	29.0	28.20	Bottom	10	0.260	1.202	0.313	0.196		27.7	
Hotspot	GPRS 850	GPRS 3 Tx Slots	A	07056	1:2.76	0.06	848.80	251	29.0	28.20	Right	10	0.196	1.202	0.236	0.148		29.0	
Hotspot	GPRS 850	GPRS 3 Tx Slots	A	07056	1:2.76	0.00	848.80	251	29.0	28.20	Left	10	0.097	1.202	0.117	0.073		32.0	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

12.2 GSM 1900 Standalone SAR

Table 12-3

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Head	GSM 1900	GSM	B	07973	1:8.3	-0.05	1880.00	661	30.5	30.03	Right Cheek	0	0.042	1.114	0.047	0.029		32.7	30.0
Head	GSM 1900	GSM	B	07973	1:8.3	0.03	1880.00	661	30.5	30.03	Right Tilt	0	0.046	1.114	0.051	0.032		32.3	
Head	GSM 1900	GSM	B	07973	1:8.3	-0.17	1880.00	661	30.5	30.03	Left Cheek	0	0.079	1.114	0.088	0.055	A4	30.0	
Head	GSM 1900	GSM	B	07973	1:8.3	0.03	1880.00	661	30.5	30.03	Left Tilt	0	0.049	1.114	0.055	0.034		32.1	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 12-4

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Body-worn	GSM 1900	GSM	B	07999	1:8.3	-0.04	1880.00	661	30.5	30.03	Back	10	0.123	1.114	0.137	0.086	A5	28.1	26.4
Body-worn	GSM 1900	GSM	B	07999	1:8.3	-0.05	1880.00	661	30.5	30.03	Front	10	0.111	1.114	0.124	0.078		28.5	
Hotspot	GPRS 1900	GPRS 4 Tx Slots	B	07122	1:2.076	-0.01	1880.00	661	25.0	23.94	Back	10	0.140	1.276	0.179	0.112		27.4	
Hotspot	GPRS 1900	GPRS 4 Tx Slots	B	07122	1:2.076	0.04	1880.00	661	25.0	23.94	Front	10	0.089	1.276	0.114	0.071		29.4	
Hotspot	GPRS 1900	GPRS 4 Tx Slots	B	07122	1:2.076	0.03	1880.00	661	25.0	23.94	Bottom	10	0.176	1.276	0.225	0.141	A6	26.4	
Hotspot	GPRS 1900	GPRS 4 Tx Slots	B	07122	1:2.076	-0.09	1880.00	661	25.0	23.94	Left	10	0.083	1.276	0.106	0.066		29.7	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

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Table 12-5

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Head	UMTS 850	RMC	A	07080	1:1	-0.10	836.60	4183	24.0	22.88	Right Cheek	0	0.109	1.294	0.141	0.088		30.6	29.6
Head	UMTS 850	RMC	A	07080	1:1	-0.03	836.60	4183	24.0	22.88	Right Tilt	0	0.052	1.294	0.067	0.042		33.8	
Head	UMTS 850	RMC	A	07080	1:1	0.00	836.60	4183	24.0	22.88	Left Cheek	0	0.137	1.294	0.177	0.111	A7	29.6	
Head	UMTS 850	RMC	A	07080	1:1	-0.04	836.60	4183	24.0	22.88	Left Tilt	0	0.073	1.294	0.094	0.059		32.4	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population												Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 12-6

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Body-worn/Hotspot	UMTS 850	RMC	A	08039	1:1	0.03	836.60	4183	24.0	22.88	Back	10	0.473	1.294	0.612	0.383	A8	24.3	24.3
Body-worn/Hotspot	UMTS 850	RMC	A	08039	1:1	0.01	836.60	4183	24.0	22.88	Front	10	0.141	1.294	0.182	0.114		29.5	
Hotspot	UMTS 850	RMC	A	08039	1:1	-0.01	836.60	4183	24.0	22.88	Bottom	10	0.289	1.294	0.374	0.234		26.4	
Hotspot	UMTS 850	RMC	A	08039	1:1	0.01	836.60	4183	24.0	22.88	Right	10	0.225	1.294	0.291	0.182		27.5	
Hotspot	UMTS 850	RMC	A	08039	1:1	-0.03	836.60	4183	24.0	22.88	Left	10	0.112	1.294	0.145	0.091		30.5	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population												Body 1.6 W/kg (mW/g) averaged over 1 gram							

12.4 UMTS 1750 Standalone SAR

Table 12-7

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Head	UMTS 1750	RMC	B	07080	1:1	0.15	1712.40	1312	23.5	23.35	Right Cheek	0	0.130	1.035	0.135	0.084		30.3	29.6
Head	UMTS 1750	RMC	B	07080	1:1	-0.11	1712.40	1312	23.5	23.35	Right Tilt	0	0.091	1.035	0.094	0.059		31.9	
Head	UMTS 1750	RMC	B	07080	1:1	0.10	1712.40	1312	23.5	23.35	Left Cheek	0	0.154	1.035	0.159	0.099	A9	29.6	
Head	UMTS 1750	RMC	B	07080	1:1	-0.03	1712.40	1312	23.5	23.35	Left Tilt	0	0.103	1.035	0.107	0.067		31.4	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population												Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 12-8

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Body-worn/Hotspot	UMTS 1750	RMC	B	07056	1:1	-0.03	1712.40	1312	21.0	20.42	Back	10	0.228	1.143	0.261	0.163	A10	25.0	24.3
Body-worn/Hotspot	UMTS 1750	RMC	B	07056	1:1	0.00	1712.40	1312	21.0	20.42	Front	10	0.199	1.143	0.227	0.142		25.6	
Hotspot	UMTS 1750	RMC	B	07056	1:1	-0.19	1712.40	1312	21.0	20.42	Bottom	10	0.269	1.143	0.307	0.192	A11	24.3	
Hotspot	UMTS 1750	RMC	B	07056	1:1	0.01	1712.40	1312	21.0	20.42	Left	10	0.158	1.143	0.181	0.113		26.6	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population												Body 1.6 W/kg (mW/g) averaged over 1 gram							

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12.5 UMTS 1900 Standalone SAR

Table 12-9

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Head	UMTS 1900	RMC	B	07080	1:1	0.15	1880.00	9400	23.0	22.47	Right Cheek	0	0.066	1.130	0.075	0.047		32.4	30.2
Head	UMTS 1900	RMC	B	07080	1:1	-0.04	1880.00	9400	23.0	22.47	Right Tilt	0	0.058	1.130	0.066	0.041		33.0	
Head	UMTS 1900	RMC	B	07080	1:1	-0.01	1880.00	9400	23.0	22.47	Left Cheek	0	0.109	1.130	0.123	0.077	A12	30.2	
Head	UMTS 1900	RMC	B	07080	1:1	-0.05	1880.00	9400	23.0	22.47	Left Tilt	0	0.081	1.130	0.092	0.058		31.5	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 12-10

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Body-worn/Hotspot	UMTS 1900	RMC	B	08187	1:1	0.07	1880.00	9400	21.0	20.26	Back	10	0.153	1.186	0.181	0.113	A13	26.5	24.9
Body-worn/Hotspot	UMTS 1900	RMC	B	08187	1:1	-0.02	1880.00	9400	21.0	20.26	Front	10	0.124	1.186	0.147	0.092		27.5	
Hotspot	UMTS 1900	RMC	B	08187	1:1	-0.05	1880.00	9400	21.0	20.26	Bottom	10	0.224	1.186	0.266	0.166	A14	24.9	
Hotspot	UMTS 1900	RMC	B	08187	1:1	-0.01	1880.00	9400	21.0	20.26	Left	10	0.113	1.186	0.134	0.084		27.9	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Body 1.6 W/kg (mW/g) averaged over 1 gram								

12.6 LTE Band 71 Standalone SAR

Table 12-11

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	MPR [dB]	Max Allowed Power [dBm]	Conducted Power [dBm]	RB Size	RB Offset	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Head	LTE Band 71	20	QPSK	A	08039	1:1	0.03	680.50	133297	0.0	25.5	24.21	1	99	Right Cheek	0	0.124	1.346	0.167	0.104		31.4	31.4
Head	LTE Band 71	20	QPSK	A	08039	1:1	-0.02	680.50	133297	1.0	24.5	23.09	50	50	Right Cheek	0	0.092	1.384	0.127	0.079		31.6	
Head	LTE Band 71	20	QPSK	A	08039	1:1	-0.11	680.50	133297	0.0	25.5	24.21	1	99	Right Tilt	0	0.062	1.346	0.083	0.052		34.4	
Head	LTE Band 71	20	QPSK	A	08039	1:1	-0.01	680.50	133297	1.0	24.5	23.09	50	50	Right Tilt	0	0.043	1.384	0.060	0.038		34.9	
Head	LTE Band 71	20	QPSK	A	08039	1:1	-0.08	680.50	133297	0.0	25.5	24.21	1	99	Left Cheek	0	0.125	1.346	0.168	0.105	A15	31.4	
Head	LTE Band 71	20	QPSK	A	08039	1:1	0.04	680.50	133297	1.0	24.5	23.09	50	50	Left Cheek	0	0.095	1.346	0.131	0.082		31.4	
Head	LTE Band 71	20	QPSK	A	08039	1:1	0.06	680.50	133297	0.0	25.5	24.21	1	99	Left Tilt	0	0.076	1.346	0.102	0.064		33.5	
Head	LTE Band 71	20	QPSK	A	08039	1:1	0.02	680.50	133297	1.0	24.5	23.09	50	50	Left Tilt	0	0.056	1.384	0.078	0.049		33.7	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Head 1.6 W/kg (mW/g) averaged over 1 gram												

Table 12-12

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	MPR [dB]	Max Allowed Power [dBm]	Conducted Power [dBm]	RB Size	RB Offset	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Body-worn/Hotspot	LTE Band 71	20	QPSK	A	08039	1:1	0.02	680.50	133297	25.5	24.21	1	99	Back	10	0.343	1.346	0.462	0.289	A16	27.0	27.0	
Body-worn/Hotspot	LTE Band 71	20	QPSK	A	08039	1:1	0.00	680.50	133297	24.5	23.09	50	50	Back	10	0.257	1.384	0.356	0.223		27.1		
Body-worn/Hotspot	LTE Band 71	20	QPSK	A	08039	1:1	-0.01	680.50	133297	25.5	24.21	1	99	Front	10	0.139	1.346	0.187	0.117		30.9		
Body-worn/Hotspot	LTE Band 71	20	QPSK	A	08039	1:1	0.00	680.50	133297	24.5	23.09	50	50	Front	10	0.112	1.384	0.155	0.097		30.7		
Hotspot	LTE Band 71	20	QPSK	A	08039	1:1	-0.03	680.50	133297	25.5	24.21	1	99	Bottom	10	0.131	1.346	0.176	0.110		31.2		
Hotspot	LTE Band 71	20	QPSK	A	08039	1:1	0.00	680.50	133297	24.5	23.09	50	50	Bottom	10	0.092	1.384	0.127	0.079		31.6		
Hotspot	LTE Band 71	20	QPSK	A	08039	1:1	0.01	680.50	133297	25.5	24.21	1	99	Right	10	0.245	1.346	0.330	0.206		28.4		
Hotspot	LTE Band 71	20	QPSK	A	08039	1:1	-0.02	680.50	133297	24.5	23.09	50	50	Right	10	0.193	1.384	0.267	0.167		28.4		
Hotspot	LTE Band 71	20	QPSK	A	08039	1:1	-0.01	680.50	133297	25.5	24.21	1	99	Left	10	0.134	1.346	0.180	0.113		31.1		
Hotspot	LTE Band 71	20	QPSK	A	08039	1:1	0.00	680.50	133297	24.5	23.09	50	50	Left	10	0.110	1.384	0.152	0.095		30.8		
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Body 1.6 W/kg (mW/g) averaged over 1 gram												

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12.11 LTE Band 66 (AWS) Standalone SAR

Table 12-21

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	MPR [dB]	Max Allowed Power [dBm]	Conducted Power [dBm]	RB Size	RB Offset	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Head	LTE Band 66	20	QPSK	B	07056	1:1	0.05	1720.00	132072	0.0	25.5	25.22	1	0	Right Cheek	0	0.190	1.067	0.203	0.127	A25	30.6	30.0
Head	LTE Band 66	20	QPSK	B	07056	1:1	-0.09	1720.00	132072	1.0	24.5	24.31	50	0	Right Cheek	0	0.154	1.045	0.161	0.101		30.6	
Head	LTE Band 66	20	QPSK	B	07056	1:1	-0.01	1720.00	132072	0.0	25.5	25.22	1	0	Right Tilt	0	0.125	1.067	0.133	0.083		32.4	
Head	LTE Band 66	20	QPSK	B	07056	1:1	-0.08	1720.00	132072	1.0	24.5	24.31	50	0	Right Tilt	0	0.109	1.045	0.114	0.071		32.1	
Head	LTE Band 66	20	QPSK	B	07056	1:1	-0.02	1720.00	132072	0.0	25.5	25.22	1	0	Left Cheek	0	0.182	1.067	0.194	0.121		30.7	
Head	LTE Band 66	20	QPSK	B	07056	1:1	0.00	1720.00	132072	1.0	24.5	24.31	50	0	Left Cheek	0	0.176	1.045	0.184	0.115		30.0	
Head	LTE Band 66	20	QPSK	B	07056	1:1	-0.01	1720.00	132072	0.0	25.5	25.22	1	0	Left Tilt	0	0.131	1.067	0.140	0.088		32.2	
Head	LTE Band 66	20	QPSK	B	07056	1:1	0.01	1720.00	132072	1.0	24.5	24.31	50	0	Left Tilt	0	0.125	1.045	0.131	0.082		31.5	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																	Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 12-22

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	MPR [dB]	Max Allowed Power [dBm]	Conducted Power [dBm]	RB Size	RB Offset	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Head	LTE Band 66	20	QPSK	C	07296	1:1	-0.01	1720.00	132072	0.0	22.5	22.12	1	0	Right Cheek	0	0.188	1.091	0.205	0.128		27.5	27.5
Head	LTE Band 66	20	QPSK	C	07296	1:1	0.03	1720.00	132072	0.0	22.5	22.11	50	0	Right Cheek	0	0.170	1.094	0.186	0.116		27.9	
Head	LTE Band 66	20	QPSK	C	07296	1:1	0.07	1720.00	132072	0.0	22.5	22.12	1	0	Right Tilt	0	0.063	1.091	0.069	0.043		32.3	
Head	LTE Band 66	20	QPSK	C	07296	1:1	0.13	1720.00	132072	0.0	22.5	22.11	90	0	Right Tilt	0	0.058	1.094	0.063	0.039		32.6	
Head	LTE Band 66	20	QPSK	C	07296	1:1	0.21	1720.00	132072	0.0	22.5	22.12	1	0	Left Cheek	0	0.095	1.091	0.060	0.038		32.8	
Head	LTE Band 66	20	QPSK	C	07296	1:1	0.08	1720.00	132072	0.0	22.5	22.11	50	0	Left Cheek	0	0.049	1.094	0.054	0.034		33.3	
Head	LTE Band 66	20	QPSK	C	07296	1:1	0.09	1720.00	132072	0.0	22.5	22.12	1	0	Left Tilt	0	0.034	1.091	0.037	0.023		34.9	
Head	LTE Band 66	20	QPSK	C	07296	1:1	0.02	1720.00	132072	0.0	22.5	22.11	50	0	Left Tilt	0	0.031	1.094	0.034	0.021		35.3	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																	Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 12-23

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	MPR [dB]	Max Allowed Power [dBm]	Conducted Power [dBm]	RB Size	RB Offset	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Body-worn/Hotspot	LTE Band 66	20	QPSK	B	08039	1:1	0.06	1720.00	132072	0.0	20.5	19.83	1	50	Back	10	0.155	1.167	0.181	0.113		26.1	25.3
Body-worn/Hotspot	LTE Band 66	20	QPSK	B	08039	1:1	0.02	1720.00	132072	0.0	20.5	19.92	50	25	Back	10	0.158	1.143	0.181	0.113	A26	26.1	
Body-worn/Hotspot	LTE Band 66	20	QPSK	B	08039	1:1	0.00	1720.00	132072	0.0	20.5	19.83	1	50	Front	10	0.141	1.167	0.165	0.103		26.5	
Body-worn/Hotspot	LTE Band 66	20	QPSK	B	08039	1:1	-0.01	1720.00	132072	0.0	20.5	19.92	50	25	Front	10	0.141	1.143	0.161	0.101		26.6	
Hotspot	LTE Band 66	20	QPSK	B	08039	1:1	0.00	1720.00	132072	0.0	20.5	19.83	1	50	Bottom	10	0.183	1.167	0.214	0.134	A27	25.3	
Hotspot	LTE Band 66	20	QPSK	B	08039	1:1	0.01	1720.00	132072	0.0	20.5	19.92	50	25	Bottom	10	0.188	1.143	0.215	0.134	A27	25.3	
Hotspot	LTE Band 66	20	QPSK	B	08039	1:1	-0.04	1720.00	132072	0.0	20.5	19.83	1	50	Left	10	0.107	1.167	0.125	0.078		27.7	
Hotspot	LTE Band 66	20	QPSK	B	08039	1:1	0.00	1720.00	132072	0.0	20.5	19.92	50	25	Left	10	0.109	1.143	0.125	0.078		27.7	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																	Body 1.6 W/kg (mW/g) averaged over 1 gram						

Table 12-24

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	MPR [dB]	Max Allowed Power [dBm]	Conducted Power [dBm]	RB Size	RB Offset	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Body-worn/Hotspot	LTE Band 66	20	QPSK	C	07296	1:1	-0.02	1720.00	132072	0.0	21.0	20.83	1	0	Back	10	0.066	1.040	0.069	0.043		30.8	30.8
Body-worn/Hotspot	LTE Band 66	20	QPSK	C	07296	1:1	-0.08	1720.00	132072	0.0	21.0	20.96	50	0	Back	10	0.068	1.008	0.069	0.043		30.8	
Body-worn/Hotspot	LTE Band 66	20	QPSK	C	07296	1:1	-0.03	1720.00	132072	0.0	21.0	20.83	1	0	Front	10	0.016	1.040	0.017	0.011		36.9	
Body-worn/Hotspot	LTE Band 66	20	QPSK	C	07296	1:1	0.01	1720.00	132072	0.0	21.0	20.96	50	0	Front	10	0.016	1.008	0.016	0.010		37.1	
Hotspot	LTE Band 66	20	QPSK	C	07296	1:1	-0.07	1720.00	132072	0.0	21.0	20.83	1	0	Top	10	0.005	1.040	0.005	0.003		42.0	
Hotspot	LTE Band 66	20	QPSK	C	07296	1:1	0.09	1720.00	132072	0.0	21.0	20.96	50	0	Top	10	0.006	1.008	0.006	0.004		41.3	
Hotspot	LTE Band 66	20	QPSK	C	07296	1:1	0.00	1720.00	132072	0.0	21.0	20.83	1	0	Left	10	0.054	1.040	0.056	0.035		31.6	
Hotspot	LTE Band 66	20	QPSK	C	07296	1:1	-0.01	1720.00	132072	0.0	21.0	20.96	50	0	Left	10	0.055	1.008	0.055	0.034		31.7	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																	Body 1.6 W/kg (mW/g) averaged over 1 gram						

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Table 12-58

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Waveform	MPR [dB]	Max Allowed Power [dBm]	Conducted Power [dBm]	RB Size	RB Offset	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Body-worn/Hotspot	NR Band n48	40	QPSK	F	07973	1:1	0.00	3570.00	638000	DFT-s-OFDM	0.0	18.0	18.00	1	104	Back	10	0.372	1.000	0.372	0.233		20.4	19.9
Body-worn/Hotspot	NR Band n48	40	QPSK	F	07973	1:1	-0.01	3570.00	638000	DFT-s-OFDM	0.0	18.0	17.99	50	56	Back	10	0.294	1.002	0.295	0.184		21.4	
Body-worn/Hotspot	NR Band n48	40	QPSK	F	07973	1:1	0.03	3624.99	641666	CP-OFDM	0.0	18.0	17.92	1	1	Back	10	0.414	1.019	0.422	0.264	A59	19.9	
Body-worn/Hotspot	NR Band n48	40	QPSK	F	07973	1:1	-0.14	3570.00	638000	DFT-s-OFDM	0.0	18.0	18.00	1	104	Front	10	0.101	1.000	0.101	0.063		26.1	
Body-worn/Hotspot	NR Band n48	40	QPSK	F	07973	1:1	-0.03	3570.00	638000	DFT-s-OFDM	0.0	18.0	17.99	50	56	Front	10	0.097	1.002	0.097	0.061		26.3	
Hotspot	NR Band n48	40	QPSK	F	07973	1:1	0.04	3570.00	638000	DFT-s-OFDM	0.0	18.0	18.00	1	104	Top	10	0.107	1.000	0.107	0.067		25.8	
Hotspot	NR Band n48	40	QPSK	F	07973	1:1	0.02	3570.00	638000	DFT-s-OFDM	0.0	18.0	17.99	50	56	Top	10	0.101	1.002	0.101	0.063		26.1	
Hotspot	NR Band n48	40	QPSK	F	07973	1:1	-0.07	3570.00	638000	DFT-s-OFDM	0.0	18.0	18.00	1	104	Left	10	0.175	1.000	0.175	0.109		23.7	
Hotspot	NR Band n48	40	QPSK	F	07973	1:1	-0.05	3570.00	638000	DFT-s-OFDM	0.0	18.0	17.99	50	56	Left	10	0.169	1.002	0.169	0.106		23.8	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																		Body 1.6 W/kg (mW/g) averaged over 1 gram						

Table 12-59

Exposure	Band / Mode	Bandwidth [MHz]	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Waveform	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]		
Body-worn/Hotspot	NR Band n48	40	E	07973	1:1	-0.01	3570.00	638000	CW/SRS	15.0	14.90	Back	10	0.151	1.023	0.154	0.096		21.2	21.2		
Body-worn/Hotspot	NR Band n48	40	E	07973	1:1	0.02	3570.00	638000	CW/SRS	15.0	14.90	Front	10	0.070	1.023	0.072	0.045		24.6			
Hotspot	NR Band n48	40	E	07973	1:1	0.14	3570.00	638000	CW/SRS	15.0	14.90	Top	10	0.069	1.023	0.071	0.044		24.6			
Hotspot	NR Band n48	40	E	07973	1:1	0.04	3570.00	638000	CW/SRS	15.0	14.90	Left	10	0.032	1.023	0.033	0.021		28.0			
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																		Body 1.6 W/kg (mW/g) averaged over 1 gram				

Table 12-60

Exposure	Band / Mode	Bandwidth [MHz]	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Waveform	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]		
Body-worn/Hotspot	NR Band n48	40	H	07973	1:1	-0.21	3570.00	638000	CW/SRS	12.5	12.08	Back	10	0.020	1.102	0.022	0.014		27.2	27.0		
Body-worn/Hotspot	NR Band n48	40	H	07973	1:1	-0.18	3570.00	638000	CW/SRS	12.5	12.08	Front	10	0.007	1.102	0.008	0.005		31.8			
Hotspot	NR Band n48	40	H	07973	1:1	0.04	3570.00	638000	CW/SRS	12.5	12.08	Top	10	0.021	1.102	0.023	0.014		27.0			
Hotspot	NR Band n48	40	H	07973	1:1	0.02	3570.00	638000	CW/SRS	12.5	12.08	Left	10	0.003	1.102	0.003	0.002		35.4			
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																		Body 1.6 W/kg (mW/g) averaged over 1 gram				

Table 12-61

Exposure	Band / Mode	Bandwidth [MHz]	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Waveform	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]		
Body-worn/Hotspot	NR Band n48	40	G	07973	1:1	-0.10	3570.00	638000	CW/SRS	13.0	12.51	Back	10	0.065	1.119	0.073	0.046		22.5	22.5		
Body-worn/Hotspot	NR Band n48	40	G	07973	1:1	0.04	3570.00	638000	CW/SRS	13.0	12.51	Front	10	0.005	1.119	0.006	0.004		33.6			
Hotspot	NR Band n48	40	G	07973	1:1	0.01	3570.00	638000	CW/SRS	13.0	12.51	Top	10	0.003	1.119	0.003	0.002		35.9			
Hotspot	NR Band n48	40	G	07973	1:1	-0.11	3570.00	638000	CW/SRS	13.0	12.51	Right	10	0.041	1.119	0.046	0.029		24.5			
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																		Body 1.6 W/kg (mW/g) averaged over 1 gram				

Table 12-62

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Waveform	MPR [dB]	Max Allowed Power [dBm]	Conducted Power [dBm]	RB Size	RB Offset	Test Position	Spacing [mm]	Measured 10g SAR [W/kg]	Power Scaling Factor	Reported 10g SAR [W/kg]	Exposure Ratio (10g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]
Phablet	NR Band n48	40	QPSK	F	07973	1:1	-0.01	3570.00	638000	DFT-s-OFDM	0.0	18.0	18.00	1	104	Back	0	1.020	1.000	1.020	0.255		20.0	18.4
Phablet	NR Band n48	40	QPSK	F	07973	1:1	0.00	3570.00	638000	DFT-s-OFDM	0.0	18.0	17.99	50	56	Back	0	1.070	1.002	1.072	0.268		19.8	
Phablet	NR Band n48	40	QPSK	F	07973	1:1	0.06	3624.99	641666	CP-OFDM	0.0	18.0	17.92	1	1	Back	0	1.450	1.019	1.478	0.370	A60	18.4	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																		Phablet 4.0 W/kg (mW/g) averaged over 10 grams						

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Table 12-68

Exposure	Band / Mode	Bandwidth [MHz]	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Waveform	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]			
Body-worn/Hotspot	NR Band n77 DoD	100	E	07973	1:1	-0.15	3500.01	633334	CW/SRS	14.0	12.11	Back	10	0.057	1.545	0.088	0.055		22.7	19.9			
Body-worn/Hotspot	NR Band n77	100	E	07973	1:1	-0.06	3930.00	662000	CW/SRS	14.0	13.54	Back	10	0.150	1.112	0.167	0.104		19.9		19.9		
Body-worn/Hotspot	NR Band n77	100	E	07973	1:1	0.13	3750.00	650000	CW/SRS	14.0	13.47	Front	10	0.093	1.130	0.105	0.065		21.9			19.9	
Hotspot	NR Band n77	100	E	07973	1:1	0.13	3930.00	662000	CW/SRS	14.0	13.54	Top	10	0.125	1.112	0.139	0.087		20.7				19.9
Hotspot	NR Band n77	100	E	07973	1:1	-0.06	3930.00	662000	CW/SRS	14.0	13.54	Left	10	0.054	1.112	0.060	0.038		24.3				
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram										

Table 12-69

Exposure	Band / Mode	Bandwidth [MHz]	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Waveform	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]			
Body-worn/Hotspot	NR Band n77 DoD	100	H	07973	1:1	-0.10	3500.01	633334	CW/SRS	10.0	8.78	Back	10	0.025	1.324	0.033	0.021		22.9	22.9			
Body-worn/Hotspot	NR Band n77	100	H	07973	1:1	0.06	3930.00	662000	CW/SRS	10.0	8.87	Back	10	0.012	1.297	0.016	0.010		26.2		22.9		
Body-worn/Hotspot	NR Band n77	100	H	07973	1:1	0.08	3930.00	662000	CW/SRS	10.0	8.87	Front	10	0.005	1.297	0.006	0.004		30.0			22.9	
Hotspot	NR Band n77	100	H	07973	1:1	0.04	3930.00	662000	CW/SRS	10.0	8.87	Top	10	0.012	1.297	0.016	0.010		26.2				22.9
Hotspot	NR Band n77	100	H	07973	1:1	0.01	3930.00	662000	CW/SRS	10.0	8.87	Left	10	0.001	1.297	0.001	0.001		37.0				
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram										

Table 12-70

Exposure	Band / Mode	Bandwidth [MHz]	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Waveform	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]			
Body-worn/Hotspot	NR Band n77 DoD	100	G	07973	1:1	-0.06	3500.01	633334	CW/SRS	11.5	9.81	Back	10	0.035	1.476	0.052	0.033		22.5	22.5			
Body-worn/Hotspot	NR Band n77	100	G	07973	1:1	-0.15	3930.00	662000	CW/SRS	11.5	11.42	Back	10	0.038	1.019	0.039	0.024		23.8		22.5		
Body-worn/Hotspot	NR Band n77	100	G	07973	1:1	-0.21	3930.00	662000	CW/SRS	11.5	11.42	Front	10	0.000	1.019	0.000	0.000		49.5			22.5	
Hotspot	NR Band n77	100	G	07973	1:1	-0.06	3930.00	662000	CW/SRS	11.5	11.42	Top	10	0.000	1.019	0.000	0.000		49.5				22.5
Hotspot	NR Band n77	100	G	07973	1:1	-0.14	3930.00	662000	CW/SRS	11.5	11.42	Right	10	0.033	1.019	0.034	0.021		24.4				
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram										

Table 12-71

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle	Power Drift [dB]	Frequency [MHz]	Channel #	Waveform	MPR [dB]	Max Allowed Power [dBm]	Conducted Power [dBm]	RB Size	RB Offset	Test Position	Spacing [mm]	Measured 10g SAR [W/kg]	Power Scaling Factor	Reported 10g SAR [W/kg]	Exposure Ratio (10g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]			
Phablet	NR Band n77	100	QPSK	F	07973	1:1	-0.01	3930.00	662000	DFT-s-OFDM	0.0	17.0	15.98	1	137	Back	0	0.505	1.265	0.639	0.160		21.1	18.5			
Phablet	NR Band n77	100	QPSK	F	07973	1:1	0.00	3930.00	662000	DFT-s-OFDM	0.0	17.0	15.97	135	69	Back	0	0.509	1.268	0.645	0.161		21.0		18.5		
Phablet	NR Band n77 DoD	100	QPSK	F	07973	1:1	0.01	3500.01	633334	CP-OFDM	0.0	17.0	15.00	1	1	Back	0	0.730	1.585	1.157	0.289	A63	18.5			18.5	
Phablet	NR Band n77	100	QPSK	F	07973	1:1	0.00	3930.00	662000	CP-OFDM	0.0	17.0	15.77	1	1	Back	0	0.616	1.327	0.817	0.204		20.0				18.5
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Phablet 4.0 W/kg (mW/g) averaged over 10 grams														

12.26 DTS SISO Standalone SAR

Table 12-72

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #	Plimit [dBm]	Overall Plimit [dBm]		
Head	2.4 GHz WiFi / IEEE 802.11b	20	DSSS	E	02347	99.57	-0.11	2437.00	6	1	14.0	13.92	Right Cheek	0	0.115	1.019	1.004	0.118	0.074		20.7	20.5		
Head	2.4 GHz WiFi / IEEE 802.11b	20	DSSS	E	02347	99.57	0.02	2437.00	6	1	14.0	13.92	Right Tilt	0	0.119	1.019	1.004	0.122	0.076	A64	20.5		20.5	
Head	2.4 GHz WiFi / IEEE 802.11b	20	DSSS	E	02347	99.57	-0.04	2437.00	6	1	14.0	13.92	Left Cheek	0	0.091	1.019	1.004	0.093	0.058		21.7			20.5
Head	2.4 GHz WiFi / IEEE 802.11b	20	DSSS	E	02347	99.57	0.04	2437.00	6	1	14.0	13.92	Left Tilt	0	0.108	1.019	1.004	0.111	0.069		21.0			
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Head 1.6 W/kg (mW/g) averaged over 1 gram											

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12.28 DSS SISO Standalone SAR

Table 12-77

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Head	2.4 GHz Bluetooth	FHSS	E	02057	76.80	0.05	2402.00	0	1	11.0	9.94	Right Cheek	0	0.050	1.276	1.016	0.065	0.041	A70
Head	2.4 GHz Bluetooth	FHSS	E	02057	76.80	-0.02	2402.00	0	1	11.0	9.94	Right Tilt	0	0.048	1.276	1.016	0.062	0.039	
Head	2.4 GHz Bluetooth	FHSS	E	02057	76.80	0.07	2402.00	0	1	11.0	9.94	Left Cheek	0	0.023	1.276	1.016	0.030	0.019	
Head	2.4 GHz Bluetooth	FHSS	E	02057	76.80	-0.16	2402.00	0	1	11.0	9.94	Left Tilt	0	0.029	1.276	1.016	0.038	0.024	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 12-78

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body-worn/Hotspot	2.4 GHz Bluetooth	FHSS	E	02057	76.80	-0.05	2402.00	0	1	11.0	9.94	Back	10	0.012	1.276	1.016	0.016	0.010	A71
Body-worn/Hotspot	2.4 GHz Bluetooth	FHSS	E	02057	76.80	0.07	2402.00	0	1	11.0	9.94	Front	10	0.010	1.276	1.016	0.013	0.008	
Hotspot	2.4 GHz Bluetooth	FHSS	E	02057	76.80	0.08	2402.00	0	1	11.0	9.94	Top	10	0.011	1.276	1.016	0.014	0.009	
Hotspot	2.4 GHz Bluetooth	FHSS	E	02057	76.80	0.03	2402.00	0	1	11.0	9.94	Left	10	0.003	1.276	1.016	0.004	0.003	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

12.29 NFC Standalone SAR

Table 12-79

Exposure	Band / Mode	Signal Type	Ant.	Serial Number	Power Drift [dB]	Frequency [MHz]	Test Position	Spacing [mm]	Measured 10g SAR [W/kg]	Plot #
Phablet	NFC	B	NFC	02347	0.07	13.60	Back	0	0.025	A72
Phablet	NFC	B	NFC	02347	0.07	13.60	Front	0	0.000	
Phablet	NFC	B	NFC	02347	0.07	13.60	Top	0	0.000	
Phablet	NFC	B	NFC	02347	0.09	13.60	Left	0	0.000	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Phablet 4.0 W/kg (mW/g) averaged over 10 grams		

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12.30 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
7. Per FCC KDB Publication 648474 D01v06r03, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were required.
8. Per FCC KDB 865664 D01v01r04, variability SAR tests were not performed since the measured SAR results for a frequency band were less than 0.8 W/kg for 1g and 2 W/kg for 10g. Please see Section 13 for variability analysis.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 7.7 for more details).
10. Per FCC KDB Publication 648474 D01v06r03, this device is considered a "phablet" since the display diagonal dimension is > 150 mm and < 200 mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.
11. Unless otherwise noted, when 10g SAR measurement is considered, a factor of 2.5 is applied to the 1g thresholds for the equivalent test cases.
12. This device uses MediaTek TAS feature for WWAN operations and for WLAN operations to control and manage transmitting power in real time to ensure RF Exposure compliance. Per FCC Guidance, compliance for was assessed at the minimum of the time averaged power and the maximum output power for each band/mode/exposure condition (ECI).

GSM Test Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2. Justification for reduced test configurations per KDB Publication 941225 D01v03r01 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
3. Per FCC KDB Publication 447498 D01v06, if the reported (scaled) SAR measured at the highest output power channel for each test configuration is ≤ 0.8 W/kg for 1g evaluations then testing at the other channels is not required for such test configuration(s).

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UMTS Notes:

1. UMTS mode was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03r01. AMR and HSPA SAR was not required per the 3G Test Reduction Procedure in KDB Publication 941225 D01v03r01.
2. Per FCC KDB Publication 447498 D01v06, if the reported (scaled) SAR measured at the highest output power channel for each test configuration is ≤ 0.8 W/kg for 1g evaluations then testing at the other channels is not required for such test configuration(s).

LTE Notes:

1. LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r04. The general test procedures used for testing can be found in Section 9.5.4.
2. 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.
3. A-MPR was disabled for all SAR tests by setting NS=01 and MCC=001 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC KDB Publication 447498 D01v06, when the reported 1g SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg for LTE B41/48, testing at the other channels was required for such test configurations.
5. TDD LTE was tested per the guidance provided in FCC KDB Publication 941225 D05v02r04. Testing was performed using UL-DL configuration 0 with 6 UL subframes and 2 S subframes using extended cyclic prefix only and special subframe configuration 6. SAR tests were performed at maximum output power and worst-case transmission duty factor in extended cyclic prefix. Per 3GPP 36.211 Section 4, the duty factor for special subframe configuration 6 using extended cyclic prefix is 0.633.
6. Per KDB Publication 941225 D05Av01r02, SAR for downlink only LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive.
7. This device supports Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operations is 43.3 % using UL-DL configuration 1. Per FCC Guidance, all SAR tests were performed using Power Class 3. SAR with power class 2 at the available duty factor was additionally performed for the power class 3 configuration with the highest SAR configuration for each exposure conditions. Please see Section 14 for linearity results.
8. For LTE Band 48, and LTE Band 41, per FCC guidance, SAR was first measured with only a single carrier active in the uplink (carrier aggregation not active). For each exposure condition, the uplink CA scenario with two component carriers was additionally tested for the configuration with the highest SAR when carrier aggregation was not active. The SCC was configured with the closest available contiguous channel. The two component carriers were configured so the resource blocks are physically allocated side by side to achieve the maximum output power.

NR Notes:

1. NR implementation supports SA and NSA mode. In EN-DC mode, NR operates with the LTE Bands shown in the NR FR1 checklist acting as anchor bands. Per FCC guidance, SAR tests for NR Bands and LTE Anchors Bands were performed separately due to limitations in SAR probe calibration factors.
2. Due to test setup limitations, SAR testing for NR TDD was performed using test mode software to establish the connection.
3. Simultaneous transmission analysis for EN-DC operations is addressed in the Part 2 Test Report (Serial Number can be found in the bibliography).
4. This device additionally supports some EN-DC conditions where additional LTE carriers are added on the downlink only.
5. Per FCC Guidance, NR modulations and RB Sizes/Offsets were selected for testing such that configurations with the highest output power were evaluated for SAR tests.

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6. Per FCC KDB Publication 447498 D01v06, when the reported NR Band n77 C-Band SAR measured at the highest output power channel in a given a test configuration was > 0.4 W/kg for 1g evaluations and > 1 W/kg for 10g evaluation, testing at the other channels was required for such test configurations.
7. Per FCC KDB Publication 447498 D01v06, when the reported NR Band n41/48 SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg for 1g evaluations and > 1.5 W/kg for 10g evaluation, testing at the other channels was required for such test configurations.
8. Per MTK guidance, SRS was tested with modulated signal. DFT-s-OFDM QPSK was used as the lowest order modulation and RB Size/Offset was selected to resemble continuous wave signal.
9. For final implementation, NR Band n41, n48 and n77 slot configuration is synchronized using maximum duty cycle of 100%. SAR testing was performed using FTM mode with a 100% duty cycle applied to match final duty cycle.
10. Per FCC Guidance, C-Band for NR n77 (3705 – 3975 MHz) was fully tested according to FCC procedures. For each exposure condition and antenna, the worst-case position was additionally evaluated for the NR n77 DoD (3455.01 – 3544.98 MHz).

WLAN Notes:

1. For held-to-ear, hotspot, and phablet operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g evaluations, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n/ax) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 9.6.5 for more information.
3. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2 W/kg for 1g evaluations. See Section 9.6.6 for more information.
4. When the maximum reported 1g averaged SAR is ≤ 0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations or all test channels were measured.
5. The device was 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. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.
6. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

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Bluetooth Notes

1. Bluetooth SAR was measured with the device connected to a call box with hopping disabled with DH5 operation and Tx Tests test mode type. Per October 2016 TCB Workshop Notes, the reported SAR was scaled to the 78% transmission duty factor for Bluetooth to determine compliance. See RF Conducted Power Section for the time domain plot and calculation for the duty factor of the device.
2. Head and Hotspot Bluetooth SAR were evaluated for BT BDR tethering applications.

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13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, all measured 1 g SAR values were <0.8 W/kg and all measured 10 g SAR values were <2.0 W/kg. Therefore, no SAR measurement variability analysis was required.

13.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for 1g and <3.75 W/kg for 10g for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

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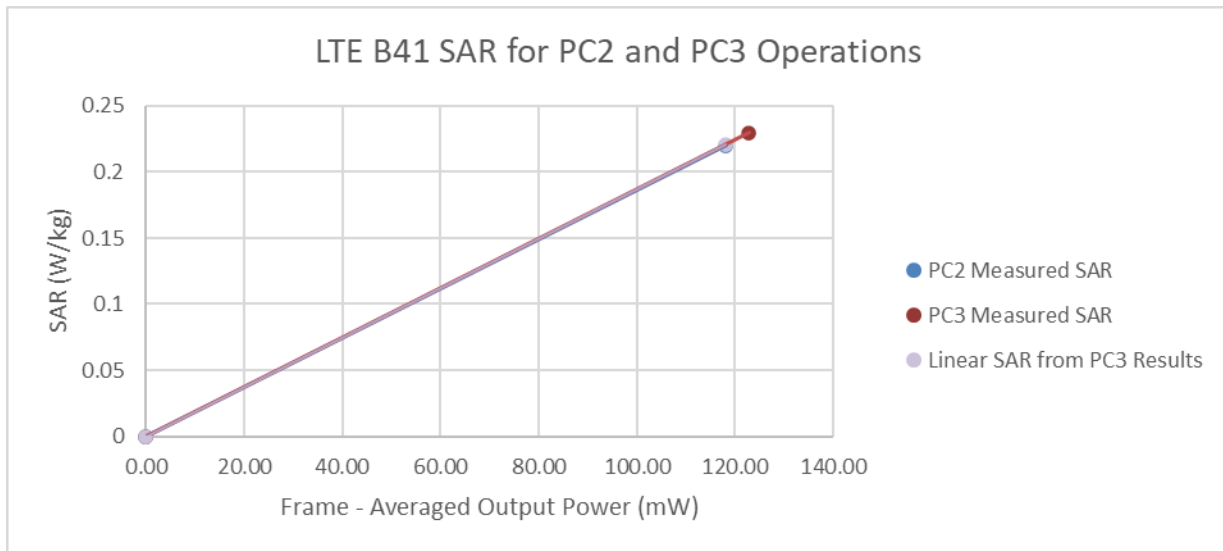
14 ADDITIONAL TESTING PER FCC GUIDANCE

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

This device supports Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operations is 43.3 % using UL-DL configuration 1. Per May 2017 TCB Workshop Notes based on the device behavior, all SAR tests were performed using Power Class 3. SAR with Power Class 2 at the highest power and available duty factor was additionally performed for the Power Class 3 configuration with the highest SAR for each exposure condition. The linearity between the Power Class 2 and Power Class 3 SAR results and the respective frame averaged powers was calculated to determine that the results were linear. Per May 2017 TCB Workshop, no additional SAR measurements were required since the linearity between power classes was < 10% and all reported SAR values were < 1.4 W/kg for 1g and < 3.5 W/kg for 10g.

**Table 14-1
LTE Band 41 Head Linearity Data – Antenna B**

	LTE Band 41 PC3	LTE Band 41 PC2
Maximum Allowed Output Power (dBm)	23.4	25.0
Measured Output Power (dBm)	22.88	24.36
Measured SAR (W/kg)	0.230	0.220
Measured Power (mW)	194.09	272.90
Duty Cycle	63.3%	43.3%
Frame Averaged Output Power (mW)	122.86	118.16
% deviation from expected linearity		-0.55%



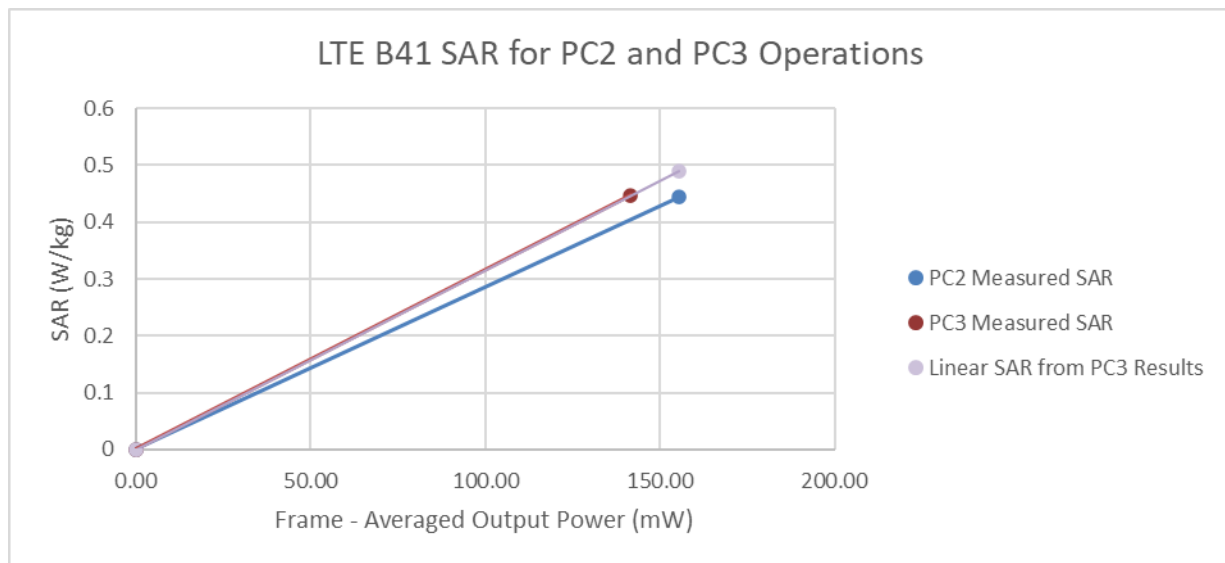
**Figure 14-1
LTE Band 41 Head Linearity - Antenna B**

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**Table 14-2
LTE Band 41 Body Linearity Data – Antenna B**

	LTE Band 41 PC3	LTE Band 41 PC2
Maximum Allowed Output Power (dBm)	24.0	25.6
Measured Output Power (dBm)	23.50	25.55
Measured SAR (W/kg)	0.447	0.444
Measured Power (mW)	223.87	358.92
Duty Cycle	63.3%	43.3%
Frame Averaged Output Power (mW)	141.71	155.41
% deviation from expected linearity		-9.43%



**Figure 14-2
LTE Band 41 Body Linearity – Antenna B**

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16 MEASUREMENT UNCERTAINTIES

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c _i 1gm	c _i 10 gms	1gm u _i (± %)	10gms u _i (± %)	v _i
Measurement System									
Probe Calibration	E.2.1	7	N	1	1	1	7.0	7.0	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	0.7	0.7	0.9	0.9	∞
Boundary Effect	E.2.3	2	R	1.732	1	1	1.2	1.2	∞
Linearity	E.2.4	0.3	N	1	1	1	0.3	0.3	∞
System Detection Limits	E.2.4	0.25	R	1.732	1	1	0.1	0.1	∞
Modulation Response	E.2.5	4.8	R	1.732	1	1	2.8	2.8	∞
Readout Electronics	E.2.6	0.3	N	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	R	1.732	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.8	R	1.732	1	1	0.5	0.5	∞
Probe Positioning w/ respect to Phantom	E.6.3	6.7	R	1.732	1	1	3.9	3.9	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	4	R	1.732	1	1	2.3	2.3	∞
Test Sample Related									
Test Sample Positioning	E.4.2	3.12	N	1	1	1	3.1	3.1	35
Device Holder Uncertainty	E.4.1	1.67	N	1	1	1	1.7	1.7	5
Output Power Variation - SAR drift measurement	E.2.9	5	R	1.732	1	1	2.9	2.9	∞
SAR Scaling	E.6.5	0	R	1.732	1	1	0.0	0.0	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	7.6	R	1.73	1.0	1.0	4.4	4.4	∞
Liquid Conductivity - measurement uncertainty	E.3.3	4.3	N	1	0.78	0.71	3.3	3.0	76
Liquid Permittivity - measurement uncertainty	E.3.3	4.2	N	1	0.23	0.26	1.0	1.1	75
Liquid Conductivity - Temperature Uncertainty	E.3.4	3.4	R	1.732	0.78	0.71	1.5	1.4	∞
Liquid Permittivity - Temperature Uncertainty	E.3.4	0.6	R	1.732	0.23	0.26	0.1	0.1	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Combined Standard Uncertainty (k=1)				RSS			12.2	12.0	191
Expanded Uncertainty (95% CONFIDENCE LEVEL)				k=2			24.4	24.0	

The above measurement uncertainties are according to IEEE Std. 1528-2013

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17 CONCLUSION

17.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Innovation, Science, and Economic Development Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

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