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PART 0 SAR AND POWER DENSITY CHAR REPORT

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1. INTRODUCTION

Qualcomm Smart Transmit cannot operate without SAR and PD characterization at the device level, beforehand. The parameters obtained from SAR and PD characterization (referred to as SAR char and PD char, respectively) will be used as input for Smart Transmit. Both SAR char and PD char will be entered via the Embedded File System (EFS) to enable the Smart Transmit feature.

2. DEVICE UNDER TEST

2.1. Device Overview

Band & Mode	Operating Modes	Tx Frequency
Cell. BC0 CDMA/EVDO	Voice/Data	824 - 849 MHz
PCS CDMA/EVDO	Voice/Data	1850 - 1910 MHz
GSM/GPRS/EDGE 850	Voice/Data	824.2 - 848.8 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.2 - 1909.8 MHz
UMTS 850	Voice/Data	827 - 846.6 MHz
UMTS 1900	Voice/Data	1854.2 - 1906.6 MHz
UMTS 1700	Voice/Data	1712 - 1753 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 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 30	Voice/Data	2305 - 2315 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR n2	Data	1852.5 – 1907.5 MHz
NR n5	Data	826.5 – 846.5 MHz
NR n66	Data	1712.5 – 1777.5 MHz
NR Band n260	Data	37025 - 39975 MHz
NR Band n261	Data	27525 - 28325 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz

This device uses the Qualcomm® Smart Transmit feature to control and manage transmitting power in real time and to ensure the time-averaged RF exposure is in compliance with the FCC requirement at all times for 2G/3G/4G/5G WWAN operations. Additionally, this device supports WLAN/BT/NFC technologies but the output power of these modems is not controlled by the Smart Transmit algorithm.

2.2 Time-Averaging for SAR and Power Density

This device is enabled with Qualcomm® Smart Transmit algorithm to control and manage transmitting power in real time and to ensure that the time-averaged RF exposure from 2G/3G/4G/5G NR Sub6/5G NR mmW WWAN is in compliance with FCC requirements. This Part 0 report shows SAR and Power Density characterization of WWAN radios for 2G/3G/4G/5G NR Sub6 and 5G NR mmW respectively. Characterization is achieved by determining PLimit for 2G/3G/4G/5G NR Sub6 and input.power.limit for 5G NR mmW that correspond 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 and PD_design_target (< FCC PD limit) for mmW radio. The SAR characterization and PD characterization are denoted as SAR Char and PD Char in this report. Section 3.3 includes a nomenclature of the specific terms used in this report.

The compliance test under the static transmission scenario and simultaneous transmission analysis are reported in Part 1 report. The validation of the time-averaging algorithm and compliance under the dynamic (time- varying) transmission scenario for WWAN technologies are reported in Part 2 report

2.3 Nomenclature for Part 0 Report

Technology	Term	Description
2G/3G/4G/ 5G NR Sub6	Plimit	Power level that corresponds to the exposure design target (SAR_design_target) after accounting for all device design related uncertainties
	Pmax	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 Plimit for all technologies and bands
	Reserve_power_margin	The margin, in dB, below the Plimit to reserve for future transmission with a minimum transmit power
5G NR mmW	input.power.limit	Power level at antenna element for each beam corresponding to the exposure design target (PD_design_target)
	PD_design_target	Target PD level < FCC SAR limit after accounting for all device design related uncertainties
	Δmin	Housing material influence
	PD Char	Table containing input.power.limit for all beams and bands

3 SAR CHARACTERIZATION

3.1 DSI and SAR Determination

This device uses different Device State Index (DSI) 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 DSI. 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 device state index (DSI) conditions used in Table 3-1 represent different exposure scenarios.

Table 3-1 DSI and Corresponding Exposure Scenarios

Scenario	Description	SAR Test Cases
Hotspot mode (DSI = 5)	■ Device transmits in hotspot mode near body ■ Hotspot Mode Active	Hotspot SAR per KDB Publication 941225 D06
Proximity sensor active (DSI=8)	■ Device transmits near body and proximity sensor is triggered ■ Proximity sensor triggered	Phablet SAR per KDB Publication 648474 D04 & KDB Publication 616217 D04

3.2 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 3-2). The reserve_power_margin is 3dB.

Table 3-2 *SAR_design_target* Calculations

SAR_design_target			
$SAR_design_target < SAR_regulatory_limit \times 10^{-Total\ Uncertainty/10}$			
1g SAR (W/kg)		**10g SAR (W/kg)**	
Total Uncertainty	0.5 dB	Total Uncertainty	0.5 dB
SAR_regulatory_limit	1.6 W/kg	SAR_regulatory_limit	4.0 W/kg
SAR_design_target	1.13 W/kg	SAR_design_target	2.83 W/kg

3.3 SAR Char

SAR test results corresponding to *Pmax* for each antenna/technology/band/DSI can be found in Appendix A. *Plimit* is calculated by linearly scaling with the measured SAR at the *Pmax* to correspond to the *SAR_design_target*. *Plimit* determination for each exposure scenario corresponding to *SAR_design_target* are shown in Table 3-3.

Table 3-3 *PLimit* Determination

Device State Index (DSI)	***PLimit* Determination Scenarios**
1	The worst-case SAR exposure is determined as maximum SAR normalized to the limit among: 1. 1g Head SAR and 2. Body Worn SAR and 3. Extremity SAR measured at 2, 1 and 3 mm spacing for back, front, bottom respectively 4. Extremity SAR measured at 0mm for left and right surfaces
5	Plimit is calculated based on 1g Hotspot SAR at 10 mm
6	Dual screen attaches at 0 or 360 degrees
7	Dual screen attaches at 180 degree
8	Plimit is calculated based on 10g Extremity SAR at 0 mm for back, bottom, and front surfaces

Note:

For DSI = 1, P_{limit} is calculated by:

P_{limit} = min{P_{limit} corresponding to 1g Head SAR at 0 mm spacing,
P_{limit} corresponding to 1g Body Worn SAR evaluation at 10 mm spacing,
P_{limit} corresponding to 10g Extremity SAR evaluation at 1~3 mm spacing,
P_{limit} corresponding to 10g Extremity SAR evaluation at 0 mm for left and right surfaces}

Table 3-4 SAR Characterizations

Mode/Band	DSI=1	DSI=6	DSI=7	DSI=5	DSI=8	Pmax*
	proximity sensor de-active	Dual Screen 0 or 360 degree	Dual Screen 180 degree	Hotspot mode	proximity sensor active	
	PLimit	PLimit	PLimit	PLimit	PLimit	
	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
CDMA BC0	27.6	27.6	27.6	27.6	27.6	25.0
CDMA BC1	26.6	26.6	26.6	22.2	22.2	24.7
GSM850**	28.8	28.8	28.8	28.8	28.8	24.5
GSM1900**	23.7	23.7	23.7	23.7	23.7	22.5
WCDMA B5	27.3	27.3	27.3	27.3	27.3	25.0
WCDMA B2	26.0	26.0	26.0	22.2	22.2	24.7
WCDMA B4	26.2	26.2	26.2	22.0	22.0	24.7
LTE B12	30.0	30.0	30.0	30.0	30.0	25.0
LTE B13	29.1	29.1	29.1	29.1	29.1	25.0
LTE B14	29.5	29.5	29.5	29.5	29.5	25.0
LTE B5	27.9	27.9	27.9	27.9	27.9	25.0
LTE B2	25.5	25.5	25.5	22.2	22.2	24.7
LTE B66(4)	25.5	25.5	25.5	22.2	22.2	24.7
LTE B30	24.6	24.6	24.6	24.6	24.6	22.2
LTE B41(PC3)**	22.9	22.9	22.9	22.9	22.9	22.7
LTE B48**	20.3	20.3	20.3	20.3	20.3	20.0
NR n5	29.5	29.5	29.5	29.5	29.5	24.2
NR n2	23.2	23.2	23.2	23.2	23.2	25.0
NR n66	22.8	22.8	22.8	22.8	22.8	25.0

Notes:

1. DSI=1 is corresponding to head SAR, body-worn SAR and extremity SAR at larger separation distances that do not trigger the proximity sensor.

2. When Hotspot Mode (DSI=5) and Extremity sensor (DSI=8) are trigged at the same time, DSI=5 takes priority, thus the P_{limit} for DSI=5 is set to be less or equal to P_{limit} for DSI=8.

3. When Dual screen attached (DSI=6 or 7) and Extremity sensor (DSI=8) are triggered at the same time, DSI=8 takes priority.

4. Plimits for DSI=6 and 7 is equal to Plimits for DSI=1.

5. When *Pmax* < *PLimit*, the DUT will operate at a power level up to P_{max}.

*Pmax is used for RF tune up procedure. The maximum allowed output power is equal to Pmax + device uncertainty.

**All PLimit power levels entered in Table 3-4 correspond to average power levels after accounting for duty cycle in the case TDD modulation schemes (for e.g., GSM & LTE TDD & NR TDD).

4 POWER DENSITY CHARACTERIZATION

4.1 Exposure Scenarios in Power Density Evaluation

For a portable handset at frequencies > 6 GHz, the power density (PD) is required to be assessed for all antenna configurations (beams) from all mmW antenna modules installed inside the device. This device has 3 patch antenna arrays (QTM#0, QTM#1, QTM#2). Per each supported band, there are a total of 135 beams: 90 SISO beams and 45 MIMO beam pairs.

As showed in Figure 4-1, the surfaces near-by each mmW antenna module for PD characterization are identified and listed in Table 4-1.

Table 4-1 Evaluation Surfaces for PD Characterization

Band & Mode	Antenna	Back S2	Front S1	Top S5	Bottom S6	Right S4	Left S3
5G NR Band n261/n260	QTM#0	Yes	No	No	No	Yes	No
	QTM#1	Yes	Yes	No	No	Yes	No
	QTM#2	Yes	Yes	No	No	No	Yes

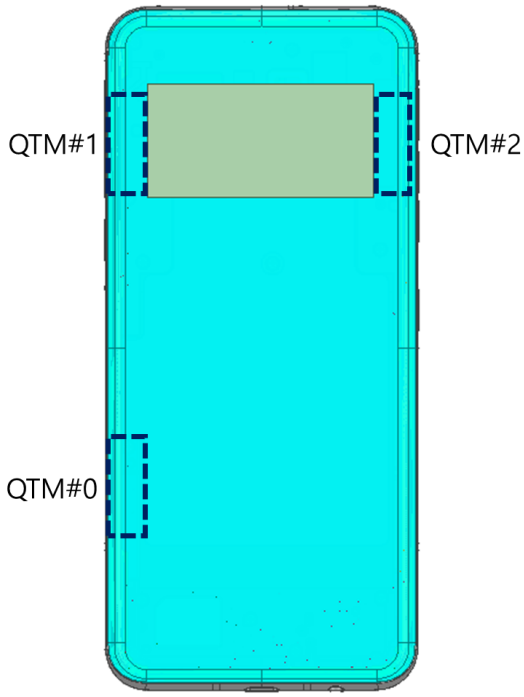

Figure 4-1: Location of mmW antenna modules looking from back of the DUT

4.2 Power Density Characterization Method

An overview of power density characterization method could be found in Figure 4-2 below.

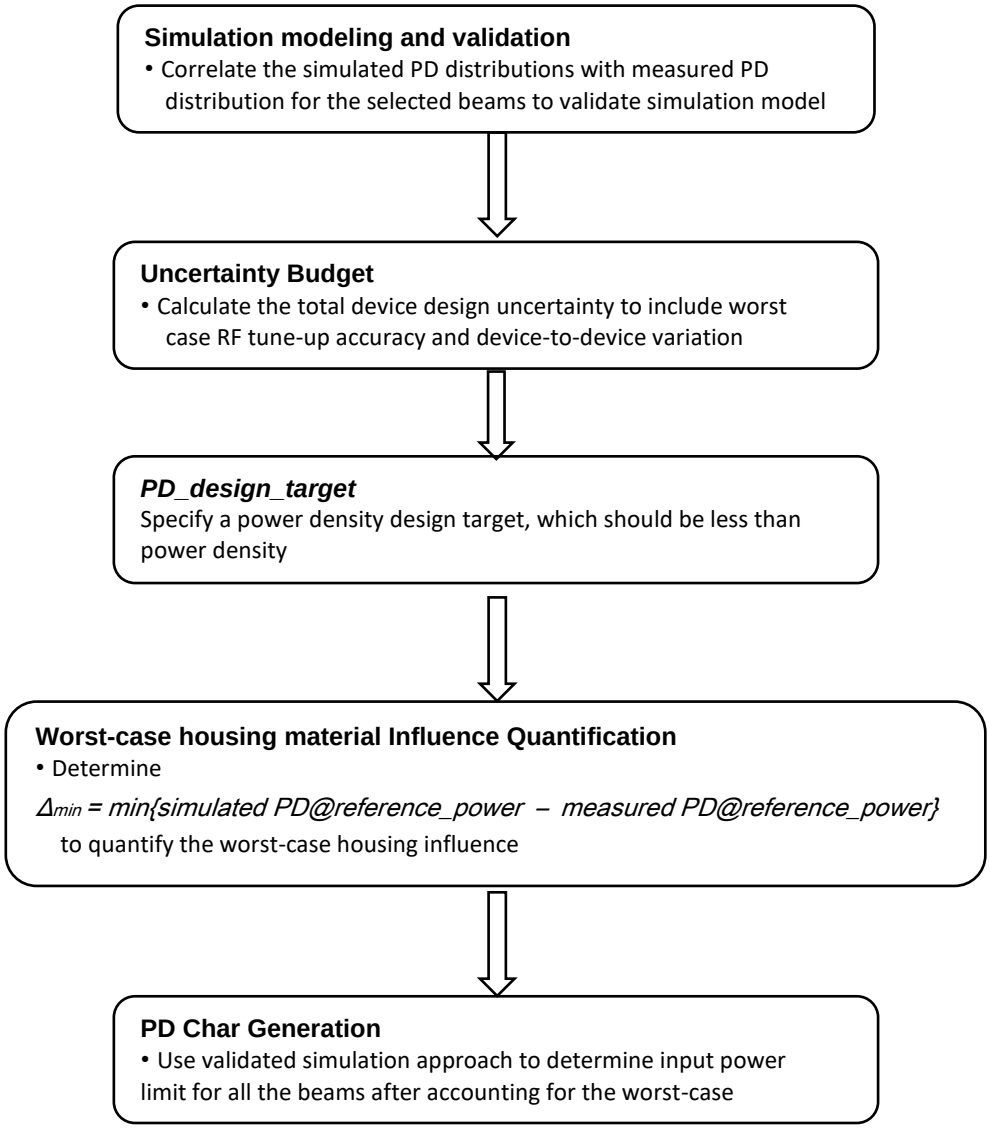

Figure 4-2 High level flow Chart for Power Density Characterization

4.3 Codebook for all supported beams

All the beams that the DUT supports are specified in the pre-defined codebook. The codebook for this device is specified as below.

Table 4-2 5G mmW NR Band n261 QTM#0 Codebook

Band	Beam ID	Ant Module ID	Ant Type	Paired With	# of Ant Feed
261	1	0	PATCH	129	1
261	6	0	PATCH	134	2
261	7	0	PATCH	135	2
261	8	0	PATCH	136	2
261	14	0	PATCH	142	2
261	15	0	PATCH	143	2
261	23	0	PATCH	151	4
261	24	0	PATCH	152	4
261	25	0	PATCH	153	4
261	26	0	PATCH	154	4
261	27	0	PATCH	155	4
261	37	0	PATCH	165	4
261	38	0	PATCH	166	4
261	39	0	PATCH	167	4
261	40	0	PATCH	168	4
261	129	0	PATCH	1	1
261	134	0	PATCH	6	2
261	135	0	PATCH	7	2
261	136	0	PATCH	8	2
261	142	0	PATCH	14	2
261	143	0	PATCH	15	2
261	151	0	PATCH	23	4
261	152	0	PATCH	24	4
261	153	0	PATCH	25	4
261	154	0	PATCH	26	4
261	155	0	PATCH	27	4
261	165	0	PATCH	37	4
261	166	0	PATCH	38	4
261	167	0	PATCH	39	4
261	168	0	PATCH	40	4

Table 4-3 5G mmW NR Band n260 QTM#0 Codebook

Band	Beam ID	Ant Module ID	Ant Type	Paired With	# of Ant Feed
260	1	0	PATCH	129	1
260	6	0	PATCH	136	2
260	7	0	PATCH	135	2
260	8	0	PATCH	134	2
260	14	0	PATCH	143	2
260	15	0	PATCH	142	2
260	23	0	PATCH	152	4
260	24	0	PATCH	153	4
260	25	0	PATCH	154	4
260	26	0	PATCH	151	4
260	27	0	PATCH	155	4
260	37	0	PATCH	168	4
260	38	0	PATCH	166	4
260	39	0	PATCH	167	4
260	40	0	PATCH	165	4
260	129	0	PATCH	1	1
260	134	0	PATCH	8	2
260	135	0	PATCH	7	2
260	136	0	PATCH	6	2
260	142	0	PATCH	15	2
260	143	0	PATCH	14	2
260	151	0	PATCH	26	4
260	152	0	PATCH	23	4
260	153	0	PATCH	24	4
260	154	0	PATCH	25	4
260	155	0	PATCH	27	4
260	165	0	PATCH	40	4
260	166	0	PATCH	38	4
260	167	0	PATCH	39	4
260	168	0	PATCH	37	4

Table 4-4 5G mmW NR Band n261 QTM#1 Codebook

Band	Beam ID	Ant Module ID	Ant Type	Paired With	# of Ant Feed
261	0	1	PATCH	128	1
261	3	1	PATCH	132	2
261	4	1	PATCH	131	2
261	5	1	PATCH	133	2
261	12	1	PATCH	141	2
261	13	1	PATCH	140	2
261	18	1	PATCH	149	4
261	19	1	PATCH	148	4
261	20	1	PATCH	147	4
261	21	1	PATCH	146	4
261	22	1	PATCH	150	4
261	33	1	PATCH	163	4
261	34	1	PATCH	162	4
261	35	1	PATCH	161	4
261	36	1	PATCH	164	4
261	128	1	PATCH	0	1
261	131	1	PATCH	4	2
261	132	1	PATCH	3	2
261	133	1	PATCH	5	2
261	140	1	PATCH	13	2
261	141	1	PATCH	12	2
261	146	1	PATCH	21	4
261	147	1	PATCH	20	4
261	148	1	PATCH	19	4
261	149	1	PATCH	18	4
261	150	1	PATCH	22	4
261	161	1	PATCH	35	4
261	162	1	PATCH	34	4
261	163	1	PATCH	33	4
261	164	1	PATCH	36	4

Table 4-5 5G mmW NR Band n260 QTM#1 Codebook

Band	Beam ID	Ant Module ID	Ant Type	Paired With	# of Ant Feed
260	0	1	PATCH	128	1
260	3	1	PATCH	133	2
260	4	1	PATCH	132	2
260	5	1	PATCH	131	2
260	12	1	PATCH	141	2
260	13	1	PATCH	140	2
260	18	1	PATCH	146	4
260	19	1	PATCH	148	4
260	20	1	PATCH	147	4
260	21	1	PATCH	150	4
260	22	1	PATCH	149	4
260	33	1	PATCH	163	4
260	34	1	PATCH	162	4
260	35	1	PATCH	161	4
260	36	1	PATCH	164	4
260	128	1	PATCH	0	1
260	131	1	PATCH	5	2
260	132	1	PATCH	4	2
260	133	1	PATCH	3	2
260	140	1	PATCH	13	2
260	141	1	PATCH	12	2
260	146	1	PATCH	18	4
260	147	1	PATCH	20	4
260	148	1	PATCH	19	4
260	149	1	PATCH	22	4
260	150	1	PATCH	21	4
260	161	1	PATCH	35	4
260	162	1	PATCH	34	4
260	163	1	PATCH	33	4
260	164	1	PATCH	36	4

Table 4-6 5G mmW NR Band n261 QTM#2 Codebook

Band	Beam ID	Ant Module ID	Ant Type	Paired With	# of Ant Feed
261	2	2	PATCH	130	1
261	9	2	PATCH	138	2
261	10	2	PATCH	139	2
261	11	2	PATCH	137	2
261	16	2	PATCH	145	2
261	17	2	PATCH	144	2
261	28	2	PATCH	159	4
261	29	2	PATCH	158	4
261	30	2	PATCH	157	4
261	31	2	PATCH	160	4
261	32	2	PATCH	156	4
261	41	2	PATCH	171	4
261	42	2	PATCH	170	4
261	43	2	PATCH	172	4
261	44	2	PATCH	169	4
261	130	2	PATCH	2	1
261	137	2	PATCH	11	2
261	138	2	PATCH	9	2
261	139	2	PATCH	10	2
261	144	2	PATCH	17	2
261	145	2	PATCH	16	2
261	156	2	PATCH	32	4
261	157	2	PATCH	30	4
261	158	2	PATCH	29	4
261	159	2	PATCH	28	4
261	160	2	PATCH	31	4
261	169	2	PATCH	44	4
261	170	2	PATCH	42	4
261	171	2	PATCH	41	4
261	172	2	PATCH	43	4

Table 4-7 5G mmW NR Band n260 QTM#2 Codebook

Band	Beam ID	Ant Module ID	Ant Type	Paired With	# of Ant Feed
260	2	2	PATCH	130	1
260	9	2	PATCH	139	2
260	10	2	PATCH	138	2
260	11	2	PATCH	137	2
260	16	2	PATCH	144	2
260	17	2	PATCH	145	2
260	28	2	PATCH	156	4
260	29	2	PATCH	157	4
260	30	2	PATCH	158	4
260	31	2	PATCH	159	4
260	32	2	PATCH	160	4
260	41	2	PATCH	169	4
260	42	2	PATCH	170	4
260	43	2	PATCH	171	4
260	44	2	PATCH	172	4
260	130	2	PATCH	2	1
260	137	2	PATCH	11	2
260	138	2	PATCH	10	2
260	139	2	PATCH	9	2
260	144	2	PATCH	16	2
260	145	2	PATCH	17	2
260	156	2	PATCH	28	4
260	157	2	PATCH	29	4
260	158	2	PATCH	30	4
260	159	2	PATCH	31	4
260	160	2	PATCH	32	4
260	169	2	PATCH	41	4
260	170	2	PATCH	42	4
260	171	2	PATCH	43	4
260	172	2	PATCH	44	4

4.4 Simulation and modeling validation

Power density simulations of all beams and surfaces were performed by the manufacturer. Details of these simulations and modeling validation can be found in the Power Density Simulation Report Rev. A. Table 4-8 includes a summary of the validation results to support worst-case housing influence quantification in power density characterization for this model.

With an input power of 6 dBm for both n261 and n260 band, PD measurements are conducted for at least one single beam per antenna type and per antenna module (QTM#0,#1,#2) on worst-surface(s) listed in Section 4.6. PD measurements are performed at mid channel of each mmW band and with CW modulation. All measured PD values are listed in Table 4-8 along with corresponding simulated PD values for the same configuration.

PD value will be used to determine worst-case housing influence for conservative assessment.

Table 4-8 Measured and Simulated 4cm^2 avg. PD for Selected Beams with 6 dBm Input Power for both n261 and n260

6dBm input measurement / simulation							4cm^2 avg. PD(W/m^2)		
Band	**Ant Type**	**Module**	**Ant Group (Ant Polarization)**	**beam ID**	**Surface**	**Channel**	**Measured**	**Simulated**	**Delta [dB]**
n261	Patch	QTM0	AG0(V)	25	Back	Mid	**9.68**	**19.10**	**2.95**
					Right	Mid	**3.88**	**8.92**	**3.62**
			AG1(H)	166	Back	Mid	**9.21**	**17.25**	**2.73**
					Right	Mid	**3.39**	**9.64**	**4.54**
		QTM1	AG0(V)	20	Right	Mid	**16.50**	**34.13**	**3.16**
					Back	Mid	**5.94**	**18.44**	**4.92**
			AG1(H)	162	Right	Mid	**16.30**	**29.46**	**2.57**
					Back	Mid	**6.03**	**14.31**	**3.75**
		QTM2	AG0(V)	44	Back	Mid	**7.51**	**19.05**	**4.04**
					Left	Mid	**6.84**	**11.75**	**2.35**
			AG1(H)	157	Back	Mid	**9.00**	**19.86**	**3.44**
					Left	Mid	**6.42**	**14.15**	**3.43**
n260	Patch	QTM0	AG0(V)	40	Back	Mid	**10.80**	**20.48**	**2.78**
					Right	Mid	**3.27**	**8.18**	**3.98**
			AG1(H)	165	Back	Mid	**10.70**	**18.82**	**2.45**
					Right	Mid	**3.16**	**6.29**	**2.99**
		QTM1	AG0(V)	18	Right	Mid	**12.30**	**16.21**	**1.20**
					Back	Mid	**4.30**	**6.87**	**2.04**
			AG1(H)	164	Right	Mid	**11.50**	**15.17**	**1.20**
					Back	Mid	**3.83**	**6.13**	**2.04**
		QTM2	AG0(V)	41	Back	Mid	**7.31**	**12.66**	**2.38**
					Left	Mid	**5.52**	**10.19**	**2.66**
			AG1(H)	157	Back	Mid	**8.52**	**12.14**	**1.54**
					Left	Mid	**4.81**	**8.59**	**2.52**

4.5 *PD_design_target*

PD_design_target is determined by ensuring that it is less than FCC PD limit after accounting for total device design uncertainties including TxAGC and device-to-device variation, specified by the manufacturer (see Table 4-9).

Table 4-9 *PD_design_target* Calculations

PD_design_target	
$PD_design_target < PD_regulatory_limit \times 10^{-\text{Total Uncertainty}/10}$	
PD over 4 cm^2 Averaging Area (W/m^2)	
Total Uncertainty	2.8 dB
PD_regulatory_limit	10 W/m^2
PD_design_target	5.248 W/m^2

4.6 Worst-case Housing Influence Determination: Δmin

For non-metal material, the material property cannot be accurately characterized at mmW frequencies to date. The estimated material property for the device housing is used in the simulation model, which could influence the accuracy in simulation for PD amplitude quantification. Since the housing influence on PD could vary from surface to surface where the EM field propagates through, the most underestimated surface is used to quantify the worst-case housing influence for conservative assessment.
Since the mmW antenna modules are placed at different location as shown in Figure 4-1, only surrounding material/housing has impact on EM field propagation, and in turn power density. Furthermore, depending on the type of antenna array, i.e., dipole antenna array or patch antenna array, the nature of EM field propagation in the near field is different. Therefore, the worst-case housing influence is determined per antenna module and per antenna type.
For this DUT, the below procedure was used to determine worst-case housing influence, *Δmin*:

1. Based on PD simulation, for each module and antenna type, determine one or more worst-surface(s) that has highest 4cm^{2}PD for all the single beams per antenna module and per antenna type in the mid channel of each band.
2. For identified worst surface(s) per antenna module and per antenna type group,
   a. First determine Δ_{min} based on identified worst surface(s), and derive *input.power.limit*
   b. Then prove all other near-by surface(s), i.e., non-selected surface(s), is not required for housing material loss quantification (in other words, these non-evaluated surfaces have no influence on the determined *input.power.limit*) by:
      i. re-scale all simulated 4cm^{2}PD values to *input.power.limit* to identify the worst-PD beam per each non-evaluated surface.
      ii. Measure 4cm^{2}PD at *input.power.limit* on identified worst-PD beam per each non-evaluated surface
      iii. Demonstrate all measured 4cm^{2}PD values are below *PD_design_target*.
3. If any of the above surface(s) in Step (2.b.iii) have measured 4cm^{2}PD ≥ *PD_design_target*, then those surfaces must be included in the Δ_{min} determination in Step (2.a), and re-evaluate *input.power.limit* with these added surfaces.

Following above procedure, based on Table 2 ~ Table 7 in PD simulation report, the worst-surface(s) having highest 4cm^{2}PD for all the single beams per each antenna type and each antenna module

group in the mid channel of n261 and n260 bands are identified as:

a. for QTM#0: Back (S2) & Right (S4)
b. for QTM#1: Back (S2) & Front (S1) & Right (S4)
c. for QTM#2: Back (S2) & Front (S1) & Left (S3)

Thus, when comparing a simulated 4 cm^2-averaged PD and measured 4 cm^2-averaged PD for the identified worst surface(s), the worst error introduced for each antenna type and each antenna module group when using the estimated material property in the simulation is highlighted in bold numbers in Table 4-8. Thus, the worst-case housing influence, denoted as Δ_{min} = Sim. PD − Meas. PD , is determined as

Table 4-10 Δ_{min} for QTM#0, QTM#1 and QTM#2

Band	Ant Module	Δ_{min} (dB)
n261	QTM#0 (Patch Beam)	2.73
	QTM#1 (Patch Beam)	2.57
	QTM#2 (Patch Beam)	2.35
n260	QTM#0 (Patch Beam)	2.45
	QTM#1 (Patch Beam)	1.20
	QTM#2 (Patch Beam)	1.54

Δ_{min} represents the worst case where RF exposure is underestimated the most in simulation when using the estimated material property of the housing. For conservative assessment, the Δ_{min} is used as the worst-case factor and applied to all the beams in the corresponding antenna type and antenna module group to determine input power limits in PD char for compliance.

The detail *input.power.limit* derivation is described in Section 4.7.

Simulated 4cm^2PD values in Table 2 ~ Table 7 in Power Density Simulation Report are scaled to *input.power.limit* and are listed in Tables 4-11 – 4-16 for all single beams for all identified surfaces (shown in Table 4-1), when assuming the simulation is performed with correct housing influence.

Determine the worst beam for each of non-selected surface(s), i.e.,

a. for QTM#0: Left (S3), Front (S1)
b. for QTM#1: Front (S1), Left (S3), Top (S5)
c. for QTM#2: Front (S1), Right (S4), Top (S5)

Then perform PD measurement for all determined worst-case beams, highlighted in red in Tables 4-11 – 4-18, on the corresponding surface. Measurement is performed in the mid channel of each band with CW modulation. The evaluation distance is at 2 mm.
The test results in Table 4-19 shows that the all measured 4 cm^2PD values are less than *PD_design_target* of 5.248 W/m^2, thus, the non-selected surfaces have no influence on the determined Δ_{min} and *input.power.limit* in Section 4.7.

Table 4-11: n261/mid channel, QTM#0 simulated 4cm^2 avg.PD (W/m^2) at *PD_Design_Target* (if simulation performed with correct housing material properties) (Δ_{min})

Band	Beam_ID	Module	Ant_Type	Num. of Feed	Front (S1)	Back (S2)	Left (S3)
n261	1	QTM0	PATCH	1	0.10	4.45	0.02
	6	QTM0	PATCH	2	0.14	4.73	0.03
	7	QTM0	PATCH	2	0.16	4.57	0.07
	8	QTM0	PATCH	2	0.28	4.47	0.05
	14	QTM0	PATCH	2	0.09	4.61	0.06
	15	QTM0	PATCH	2	0.21	4.50	0.06
	23	QTM0	PATCH	4	0.32	4.72	0.03
	24	QTM0	PATCH	4	0.20	4.54	0.07
	25	QTM0	PATCH	4	0.10	4.57	0.07
	26	QTM0	PATCH	4	0.14	4.54	0.08
	27	QTM0	PATCH	4	0.30	4.41	0.07
	37	QTM0	PATCH	4	0.20	4.45	0.03
	38	QTM0	PATCH	4	0.19	4.90	0.07
	39	QTM0	PATCH	4	0.13	4.32	0.06
	40	QTM0	PATCH	4	0.17	4.64	0.08
	129	QTM0	PATCH	1	0.10	4.56	0.02
	134	QTM0	PATCH	2	0.11	4.60	0.03
	135	QTM0	PATCH	2	0.10	4.51	0.04
	136	QTM0	PATCH	2	0.24	4.76	0.03
	142	QTM0	PATCH	2	0.07	4.59	0.03
	143	QTM0	PATCH	2	0.23	4.69	0.02
	151	QTM0	PATCH	4	0.27	4.82	0.05
	152	QTM0	PATCH	4	0.12	4.41	0.06
	153	QTM0	PATCH	4	0.10	4.54	0.07
	154	QTM0	PATCH	4	0.35	4.53	0.07
	155	QTM0	PATCH	4	0.11	4.41	0.07
	165	QTM0	PATCH	4	0.21	4.72	0.04
	166	QTM0	PATCH	4	0.10	3.87	0.09
	167	QTM0	PATCH	4	0.28	4.61	0.08
	168	QTM0	PATCH	4	0.22	4.33	0.03

Please note the above scaled simulation values correspond to PD_design_target if the simulation was performed with correct housing material properties.

Table 4-12: n261/mid channel QTM#1 simulated 4cm^2 avg.PD (W/m^2) at *PD_Design_Target* (if simulation performed with correct housing material properties) (Δ_{min})

Band	Beam_ID	Module	Ant_Type	Num. of Feed	Front (S1)	Right (S4)	Left (S3)	Top (S5)
261	0	QTM1	PATCH	1	1.53	4.94	0.05	0.08
	3	QTM1	PATCH	2	1.56	4.71	0.04	0.17
	4	QTM1	PATCH	2	1.25	4.81	0.03	0.01
	5	QTM1	PATCH	2	1.37	4.83	0.05	0.24
	12	QTM1	PATCH	2	1.37	4.97	0.06	0.07
	13	QTM1	PATCH	2	1.09	4.99	0.04	0.14
	18	QTM1	PATCH	4	1.67	4.78	0.04	0.12
	19	QTM1	PATCH	4	1.29	4.21	0.04	0.02
	20	QTM1	PATCH	4	1.25	4.81	0.04	0.11
	21	QTM1	PATCH	4	1.34	5.07	0.09	0.14
	22	QTM1	PATCH	4	1.90	5.06	0.14	0.64
	33	QTM1	PATCH	4	1.30	4.16	0.04	0.02
	34	QTM1	PATCH	4	1.54	5.07	0.04	0.02
	35	QTM1	PATCH	4	1.28	5.25	0.05	0.13
	36	QTM1	PATCH	4	1.18	4.97	0.14	0.49
	128	QTM1	PATCH	1	1.65	4.95	0.04	0.24
	132	QTM1	PATCH	2	1.93	5.06	0.04	0.03
	131	QTM1	PATCH	2	1.71	5.25	0.06	0.04
	133	QTM1	PATCH	2	1.32	4.71	0.06	0.06
	141	QTM1	PATCH	2	1.34	4.99	0.03	0.14
	140	QTM1	PATCH	2	1.82	5.25	0.05	0.04
	149	QTM1	PATCH	4	1.05	4.80	0.05	0.06
	148	QTM1	PATCH	4	2.19	5.21	0.05	0.05
	147	QTM1	PATCH	4	2.18	4.98	0.06	0.11
	146	QTM1	PATCH	4	1.94	5.22	0.10	0.17
	150	QTM1	PATCH	4	1.88	4.33	0.09	0.15
	163	QTM1	PATCH	4	2.03	5.22	0.05	0.06
	162	QTM1	PATCH	4	2.30	5.15	0.04	0.03
	161	QTM1	PATCH	4	1.82	5.12	0.09	0.18
	164	QTM1	PATCH	4	1.54	4.99	0.08	0.13

Please note the above scaled simulation values correspond to PD_design_target if the simulation was performed with correct housing material properties.

Table 4-13: n261/mid channel, QTM#2 simulated 4cm^2 avg.PD (W/m^2) at *PD_Design_Target* (if simulation performed with correct housing material properties) (Δ_{min})

Band	Beam_ID	Module	Ant_Type	Num. of Feed	Front (S1)	Back (S2)	Right (S4)	Top (S5)
n261	2	QTM2	PATCH	1	0.15	5.25	0.18	0.13
	9	QTM2	PATCH	2	0.34	5.14	0.10	0.36
	10	QTM2	PATCH	2	0.39	4.96	0.18	0.10
	11	QTM2	PATCH	2	0.38	5.25	0.17	0.16
	16	QTM2	PATCH	2	0.39	5.02	0.09	0.25
	17	QTM2	PATCH	2	0.34	5.06	0.26	0.06
	28	QTM2	PATCH	4	0.47	4.72	0.09	0.36
	29	QTM2	PATCH	4	0.50	4.95	0.05	0.14
	30	QTM2	PATCH	4	0.37	5.01	0.13	0.11
	31	QTM2	PATCH	4	0.41	5.25	0.28	0.24
	32	QTM2	PATCH	4	0.36	5.25	0.15	0.30
	41	QTM2	PATCH	4	0.59	4.76	0.05	0.23
	42	QTM2	PATCH	4	0.39	4.89	0.08	0.13
	43	QTM2	PATCH	4	0.35	5.10	0.27	0.17
	44	QTM2	PATCH	4	0.25	5.25	0.22	0.24
	130	QTM2	PATCH	1	0.33	5.25	0.10	0.08
	138	QTM2	PATCH	2	0.37	5.25	0.11	0.17
	139	QTM2	PATCH	2	0.66	5.25	0.12	0.16
	137	QTM2	PATCH	2	0.27	5.00	0.09	0.18
	145	QTM2	PATCH	2	0.49	5.25	0.04	0.18
	144	QTM2	PATCH	2	0.22	5.25	0.12	0.11
	159	QTM2	PATCH	4	0.26	5.25	0.05	0.22
	158	QTM2	PATCH	4	0.27	5.25	0.09	0.14
	157	QTM2	PATCH	4	0.43	5.15	0.09	0.10
	160	QTM2	PATCH	4	0.35	4.93	0.08	0.37
	156	QTM2	PATCH	4	0.33	5.25	0.16	0.21
	171	QTM2	PATCH	4	0.32	5.25	0.08	0.19
	170	QTM2	PATCH	4	0.56	5.16	0.09	0.07
	172	QTM2	PATCH	4	0.32	4.97	0.05	0.31
	169	QTM2	PATCH	4	0.36	5.23	0.14	0.17

Please note the above scaled simulation values correspond to PD_design_target if the simulation was performed with correct housing material properties.

Table 4-14: n260/mid channel, QTM#0 simulated 4cm^2 avg.PD (W/m^2) at *PD_Design_Target* (if simulation performed with correct housing material properties) (Δ_{min})

Band	Beam_ID	Module	Ant_Type	Num. of Feed	Front (S1)	Back (S2)	Left (S3)
n260	1	QTM0	PATCH	1	0.08	4.76	0.05
	6	QTM0	PATCH	2	0.03	5.25	0.04
	7	QTM0	PATCH	2	0.06	5.25	0.10
	8	QTM0	PATCH	2	0.03	5.05	0.08
	14	QTM0	PATCH	2	0.02	5.25	0.09
	15	QTM0	PATCH	2	0.04	5.01	0.12
	23	QTM0	PATCH	4	0.04	5.25	0.08
	24	QTM0	PATCH	4	0.07	5.00	0.05
	25	QTM0	PATCH	4	0.09	5.04	0.22
	26	QTM0	PATCH	4	0.02	5.02	0.11
	27	QTM0	PATCH	4	0.04	5.25	0.08
	37	QTM0	PATCH	4	0.06	4.99	0.03
	38	QTM0	PATCH	4	0.07	4.96	0.07
	39	QTM0	PATCH	4	0.08	4.94	0.26
	40	QTM0	PATCH	4	0.05	5.25	0.06
	129	QTM0	PATCH	1	0.03	4.47	0.08
	136	QTM0	PATCH	2	0.02	4.95	0.07
	135	QTM0	PATCH	2	0.04	4.24	0.15
	134	QTM0	PATCH	2	0.05	5.07	0.05
	143	QTM0	PATCH	2	0.03	4.50	0.07
	142	QTM0	PATCH	2	0.02	4.77	0.08
	152	QTM0	PATCH	4	0.04	4.79	0.12
	153	QTM0	PATCH	4	0.09	5.22	0.23
	154	QTM0	PATCH	4	0.04	5.25	0.11
	151	QTM0	PATCH	4	0.03	5.25	0.09
	155	QTM0	PATCH	4	0.04	4.99	0.08
	168	QTM0	PATCH	4	0.04	5.25	0.11
	166	QTM0	PATCH	4	0.07	5.25	0.23
	167	QTM0	PATCH	4	0.06	4.68	0.13
	165	QTM0	PATCH	4	0.03	4.84	0.06

Please note the above scaled simulation values correspond to PD_design_target if the simulation was performed with correct housing material properties.

Table 4-15: n260/mid channel, QTM#1 simulated 4cm^2 avg.PD (W/m^2) at *PD_Design_Target* (if simulation performed with correct housing material properties) (Δ_{min})

Band	Beam_ID	Module	Ant_Type	Num. of Feed	Front (S1)	Right (S4)	Left (S3)	Top (S5)
n260	0	QTM1	PATCH	1	1.42	5.25	0.04	0.06
	3	QTM1	PATCH	2	1.68	5.25	0.02	0.08
	4	QTM1	PATCH	2	1.76	5.25	0.06	0.11
	5	QTM1	PATCH	2	1.68	5.25	0.02	0.07
	12	QTM1	PATCH	2	1.70	5.25	0.03	0.10
	13	QTM1	PATCH	2	1.54	5.25	0.06	0.12
	18	QTM1	PATCH	4	1.56	5.25	0.04	0.10
	19	QTM1	PATCH	4	1.11	5.25	0.05	0.05
	20	QTM1	PATCH	4	1.03	5.25	0.06	0.18
	21	QTM1	PATCH	4	1.13	5.25	0.06	0.08
	22	QTM1	PATCH	4	1.08	5.25	0.04	0.05
	33	QTM1	PATCH	4	1.28	5.16	0.03	0.04
	34	QTM1	PATCH	4	2.03	5.25	0.07	0.12
	35	QTM1	PATCH	4	1.64	5.25	0.06	0.13
	36	QTM1	PATCH	4	1.35	5.07	0.03	0.08
	128	QTM1	PATCH	1	1.42	5.25	0.07	0.04
	133	QTM1	PATCH	2	1.47	5.25	0.07	0.09
	132	QTM1	PATCH	2	1.36	5.25	0.07	0.08
	131	QTM1	PATCH	2	1.57	5.25	0.09	0.11
	141	QTM1	PATCH	2	1.38	5.25	0.04	0.05
	140	QTM1	PATCH	2	1.70	5.25	0.09	0.14
	146	QTM1	PATCH	4	2.23	5.25	0.09	0.09
	148	QTM1	PATCH	4	1.63	5.25	0.06	0.10
	147	QTM1	PATCH	4	1.48	5.25	0.09	0.04
	150	QTM1	PATCH	4	2.05	5.06	0.08	0.08
	149	QTM1	PATCH	4	2.23	5.06	0.05	0.07
	163	QTM1	PATCH	4	1.73	5.25	0.05	0.02
	162	QTM1	PATCH	4	1.66	5.25	0.05	0.10
	161	QTM1	PATCH	4	2.06	5.25	0.08	0.22
	164	QTM1	PATCH	4	2.36	5.25	0.06	0.08

Please note the above scaled simulation values correspond to PD_design_target if the simulation was performed with correct housing material properties.

Table 4-16: n260/mid channel, QTM#2 simulated 4cm^2 avg.PD (W/m^2) at P*D_Design_Target* (if simulation performed with correct housing material properties) (Δ_{min})

Band	Beam_ID	Module	Ant_Type	Num. of Feed	Front (S1)	Back (S2)	Right (S4)	Top (S5)
n260	2	QTM2	PATCH	1	0.17	5.25	0.11	0.11
	9	QTM2	PATCH	2	0.38	5.25	0.08	0.06
	10	QTM2	PATCH	2	0.11	5.25	0.11	0.16
	11	QTM2	PATCH	2	0.51	5.25	0.09	0.05
	16	QTM2	PATCH	2	0.14	5.25	0.16	0.18
	17	QTM2	PATCH	2	0.22	5.05	0.10	0.15
	28	QTM2	PATCH	4	0.26	4.87	0.15	0.15
	29	QTM2	PATCH	4	0.26	5.14	0.12	0.15
	30	QTM2	PATCH	4	0.32	5.25	0.08	0.25
	31	QTM2	PATCH	4	0.28	5.24	0.14	0.14
	32	QTM2	PATCH	4	0.12	4.93	0.14	0.16
	41	QTM2	PATCH	4	0.41	5.01	0.11	0.14
	42	QTM2	PATCH	4	0.37	5.25	0.09	0.19
	43	QTM2	PATCH	4	0.29	4.55	0.09	0.23
	44	QTM2	PATCH	4	0.22	5.25	0.16	0.13
	130	QTM2	PATCH	1	0.38	4.98	0.11	0.19
	139	QTM2	PATCH	2	0.34	4.71	0.08	0.13
	138	QTM2	PATCH	2	0.23	5.25	0.06	0.21
	137	QTM2	PATCH	2	0.33	4.70	0.07	0.12
	144	QTM2	PATCH	2	0.41	5.25	0.10	0.14
	145	QTM2	PATCH	2	0.45	4.62	0.10	0.14
	156	QTM2	PATCH	4	0.49	5.25	0.11	0.12
	157	QTM2	PATCH	4	0.25	5.25	0.09	0.13
	158	QTM2	PATCH	4	0.41	4.02	0.08	0.18
	159	QTM2	PATCH	4	0.48	5.14	0.06	0.10
	160	QTM2	PATCH	4	0.52	5.25	0.13	0.14
	169	QTM2	PATCH	4	0.68	5.25	0.13	0.14
	170	QTM2	PATCH	4	0.41	4.79	0.11	0.12
	171	QTM2	PATCH	4	0.38	4.74	0.05	0.19
	172	QTM2	PATCH	4	0.56	4.63	0.14	0.11

Please note the above scaled simulation values correspond to PD_design_target if the simulation was performed with correct housing material properties.

Table 4-17: 4cm^2 avg.PD of the selected beams measured on the corresponding surfaces that are not selected for Δmin determination

Band	Antenna	Beam ID	Surface	input.power.limit (dBm)	Meas. 4cm^2 PD (W/m^2)
n261	QTM#0	154	Front (S1)	1.11	0.259
		166	Left (S3)	-0.49	0.347
	QTM#1	162	Front (S1)	-1.57	1.230
		22	Left (S3)	0.18	0.241
		22	Top (S5)	0.18	0.099
	QTM#2	139	Front (S1)	4.14	0.244
		31	Right (S4)	0.56	0.335
		160	Top (S5)	2.13	0.084
n260	QTM#0	25	Front (S1)	0.30	0.181
		39	Left (S3)	0.10	0.247
	QTM#1	164	Front (S1)	1.39	1.090
		146	Left (S3)	1.61	0.301
		161	Top (S5)	2.48	0.211
	QTM#2	169	Front (S1)	2.65	0.186
		44	Right (S4)	2.38	0.271
		30	Top (S5)	2.97	0.038

4.7 PD Char

4.7.1 Scaling Factor for Single Beams

To determine the input power limit at each antenna port, simulation was performed at low, mid and high channel for each mmW band supported, with 6dBm input power per active port for n261 band and 6dBm input power per active port for n260 band:

1. Obtained $PD_{surface}$ value (the worst PD among all identified surfaces of the DUT) at all three channels for all single beams specified in the codebook of Table 3-1.
2. Derived a scaling factor at low, mid and high channel, $s(i)_{low_or_mid_or_high}$, by:

$$s(i)_{low_or_mid_or_high} = \frac{PD\ design\ target}{sim.PD_{surface}(i)},\ i \in single\ beams \qquad (1)$$

3. Determined the worst-case scaling factor, $(\boldsymbol{ii})$, among low, mid and high channels:

$$\boldsymbol{s(i)} = \min\{s_{low}(i),\ s_{mid}(i),\ s_{high}(i)\},\ i \in \text{single beams} \qquad (2)$$

and this scaling factor applies to the input power at each antenna port.

4.7.2 Scaling Factor for Beam Pairs

Per the manufacturer, the relative phase between beam pair is not controlled in the chipset design and could vary from run to run. Therefore, for each beam pair, based on the simulation results, the worst-case scaling factor was determined mathematically to ensure the compliance. The worst-case PD for MIMO operations was found by sweeping the relative phase for all possible angles to ensure a conservative assessment. The power density simulation report contains the worst-case power density for each surface after sweeping through all relative phases between beams.

Once the power density was determined for the worst-case $\varnothing$, the scaling factor was obtained by the below equation for low, mid and high channels:

$$\boldsymbol{s(i)}_{\text{low_or_mid_or_high}} = \frac{PD\ design\ target}{total\ PD\ (\emptyset(i)_{worstcase})},\ i \in \text{single beams} \qquad (3)$$

The $total\ \mathrm{PD}(\varnothing_{\mathrm{worstcase}})$ varies with channel and beam pair, the lowest scaling factor among all three channels, $\boldsymbol{s(i)}$, is determined for the beam pair *i*:

$$\boldsymbol{s(i)} = \min\{s_{low}(i),\ s_{mid}(i),\ s_{high}(i)\},\ i \in \text{single beams} \qquad (4)$$

4.7.3 *Input.Power.Limit* Calculations

The PD Char specifies the limit of input power at antenna port that corresponds to *PD_design_target* for all the beams.

Ideally, if there is no uncertainty associated with hardware design, the input power limit, denoted as $\mathrm{input.power.limit}(i)$, for beam *i* can be obtained after accounting for the housing influence (Δ_{min}) determined in Table 4-10, given by:

- For n261

$$\mathrm{input.power.limit}(i) = 6\ \mathrm{dBm} + 10 * \log(s(i)) + \Delta_{min},\ i \in \text{all beams} \qquad (5a)$$

- For n260

$$\mathrm{input.power.limit}(i) = 6\ \mathrm{dBm} + 10 * \log(s(i)) + \Delta_{min},\ i \in \text{all beams} \qquad (5b)$$

where 6 dBm is the input powers used in simulation for n261 and n260 ; $s(i)$ is the scaling factor obtained from Eq. (2) or Eq. (4) for beam *i*; Δ_{min} is the worst-case housing influence factor (determined in Table 4-10) for beam *i*.

If simulation overestimates the housing influence, then Δ_{min} (= simulated PD – measured PD) is

negative, which means that the measured PD would be higher than the simulated PD. The input power to antenna elements determined via simulation must be decreased for compliance.

Similarly, if simulation underestimates the loss, then $\Delta_{\min}$ is positive (measured PD would be lower than the simulated value). Input power to antenna elements determined via simulation can be increased and still be PD compliant.

In reality the hardware design has uncertainty which must be properly considered. The device design related uncertainty is embedded in the process of $\Delta_{\min}$ determination. Since the device uncertainty is already accounted for in *PD_design_target*, it needs to be removed to avoid double counting this uncertainty. Thus, Equation 5a and 5b is modified to:

If -TxAGC uncertainty < *Δmin* < TxAGC uncertainty,

$$\text{input.power.limit}(i) = 6\ \text{dBm} + 10 * \log(s(i)),\ i \in \text{all beams, for n261} \quad (6a)$$

$$\text{input.power.limit}(i) = 6\ \text{dBm} + 10 * \log(s(i)),\ i \in \text{all beams, for n260} \quad (6b)$$

else if *Δmin* < -TxAGC uncertainty,

$$\text{input.power.limit}(i) = 6\ \text{dBm} + 10 * \log(s(i)) + (\Delta_{\min} + \text{TxAGC uncertainty}),$$
$$i \in \text{all beams, for n261} \quad (7a)$$

$$\text{input.power.limit}(i) = 6\ \text{dBm} + 10 * \log(s(i)) + (\Delta_{\min} + \text{TxAGC uncertainty}),$$
$$i \in \text{all beams, for n260} \quad (7b)$$

else if *Δmin* > TxAGC uncertainty,

$$\text{input.power.limit}(i) = 6\ \text{dBm} + 10 * \log(s(i)) + (\Delta_{\min} - \text{TxAGC uncertainty}),$$
$$i \in \text{all beams, for n261} \quad (8a)$$

$$\text{input.power.limit}(i) = 6\ \text{dBm} + 10 * \log(s(i)) + (\Delta_{\min} - \text{TxAGC uncertainty}),$$
$$i \in \text{all beams, for n260} \quad (8b)$$

Following above logic, the *input.power.limit* for this DUT can be calculated using Equations (6a), (6b), (7a), (7b) and (8a) and (8b), i.e.,

Table 4-18 *input.power.limit* Calculation

Band	Ant Module	$\Delta_{\min}$ (dB)	TxAGC Uncertainty (dB)	input.power.limit(dBm)=	Notes
n261	QTM#0 (Patch Beam)	2.73	0.5	6 dBm + 10 * log(s(i)) + 2.23	Using Eq. 8a
	QTM#1 (Patch Beam)	2.57	0.5	6 dBm + 10 * log(s(i)) + 2.07	Using Eq. 8a
	QTM#2 (Patch Beam)	2.35	0.5	6 dBm + 10 * log(s(i)) + 1.85	Using Eq. 8a
n260	QTM#0 (Patch Beam)	2.45	0.5	6 dBm + 10 * log(s(i)) + 1.95	Using Eq. 8b
	QTM#1 (Patch Beam)	1.20	0.5	6 dBm + 10 * log(s(i)) + 0.70	Using Eq. 8b
	QTM#2 (Patch Beam)	1.54	0.5	6 dBm + 10 * log(s(i)) + 1.04	Using Eq. 8b

Thus, the DUT PD Char for n261 and n260 bands is as shown in the tables 4-19 – 4-24 below. The input.power.limit for a single beam does not apply to ensure PD margin, only the calculation of the MIMO beam input.power.limit. The full simulation results used to support this calculation can be found in the Power Density Simulation Report.

Table 4-19 5G NR n261 QTM#0 *input.power.limit*

Band	Beam_ID	Paired with Beam_ID	Input.Power.Limit (dBm)
n261	1		4.80
	6		2.67
	7		2.06
	8		2.71
	14		1.99
	15		2.30
	23		1.91
	24		0.88
	25		-0.21
	26		0.64
	27		0.88
	37		0.89
	38		0.52
	39		-0.31
	40		0.97
	129		4.95
	134		2.75
	135		2.14
	136		2.89
	142		2.09
	143		2.74
	151		1.09
	152		0.42
	153		0.55
	154		1.11
	155		0.68
	165		0.85
	166		-0.49
	167		0.95
	168		0.82
	1	129	4.00
	6	134	1.80
	7	135	1.13
	8	136	1.62
	14	142	0.77
	15	143	1.61
	23	151	-0.79
	24	152	-0.86
	25	153	-1.56
	26	154	-0.61
	27	155	-0.69
	37	165	-0.98
	38	166	-1.27
	39	167	-1.41
	40	168	-0.55

Table 4-20 5G NR n261 QTM#1 *input.power.limit*

Band	Beam_ID	Paired with Beam_ID	Input.Power.Limit (dBm)
n261	0		3.04
	3		-0.07
	4		0.05
	5		1.00
	12		0.49
	13		0.47
	18		-1.98
	19		-2.35
	20		-2.51
	21		-1.22
	22		0.18
	33		-2.33
	34		-1.98
	35		-1.79
	36		-0.49
	128		4.24
	132		0.32
	131		0.36
	133		1.65
	141		1.19
	140		0.04
	149		-1.00
	148		-1.08
	147		-1.22
	146		-1.16
	150		0.18
	163		-0.58
	162		-1.57
	161		-0.98
	164		-0.02
	0	128	4.08
	3	132	0.68
	4	131	0.49
	5	133	1.08
	12	141	1.42
	13	140	0.68
	18	149	-1.30
	19	148	-1.64
	20	147	-1.68
	21	146	-1.68
	22	150	0.51
	33	163	-1.62
	34	162	-1.91
	35	161	-1.52
	36	164	0.36

Table 4-21 5G NR n261 QTM#2 *input.power.limit*

Band	Beam_ID	Paired with Beam_ID	Input.Power.Limit (dBm)
n261	2		6.44
	9		3.94
	10		3.13
	11		2.93
	16		3.64
	17		2.76
	28		1.70
	29		0.49
	30		0.54
	31		0.56
	32		0.61
	41		0.85
	42		0.49
	43		0.70
	44		0.40
	130		5.54
	138		2.80
	139		4.14
	137		4.50
	145		4.70
	144		2.29
	159		0.70
	158		0.45
	157		0.14
	160		2.13
	156		1.37
	171		0.71
	170		0.60
	172		1.41
	169		1.32
	2	130	4.54
	9	138	1.30
	10	139	1.89
	11	137	2.08
	16	145	3.13
	17	144	0.88
	28	159	-0.49
	29	158	-0.94
	30	157	-1.39
	31	160	0.14
	32	156	-0.65
	41	171	-0.72
	42	170	-1.28
	43	172	0.08
	44	169	-0.80

Table 4-22 5G NR n260 QTM#0 *input.power.limit*

Band	Beam_ID	Paired with Beam_ID	Input.Power.Limit (dBm)
n260	1		6.06
	6		2.34
	7		3.09
	8		2.50
	14		3.24
	15		2.66
	23		0.28
	24		0.27
	25		0.30
	26		0.15
	27		0.11
	37		0.24
	38		0.32
	39		0.10
	40		0.09
	129		5.47
	136		2.14
	135		3.29
	134		3.50
	143		3.76
	142		2.15
	152		0.09
	153		0.59
	154		0.85
	151		0.62
	155		0.26
	168		0.99
	166		0.62
	167		0.91
	165		0.11
	1	129	4.80
	6	136	2.09
	7	135	2.59
	8	134	2.40
	14	143	2.32
	15	142	0.98
	23	152	-1.00
	24	153	-0.77
	25	154	-0.41
	26	151	-0.89
	27	155	-1.15
	37	168	-0.74
	38	166	-0.73
	39	167	-0.66
	40	165	-1.23

Table 4-23 5G NR n260 QTM#1 *input.power.limit*

Band	Beam_ID	Paired with Beam_ID	Input.Power.Limit (dBm)
n260	0		7.24
	3		3.47
	4		4.54
	5		3.56
	12		3.03
	13		3.97
	18		1.10
	19		1.67
	20		1.92
	21		1.22
	22		1.32
	33		1.07
	34		2.68
	35		1.45
	36		1.11
	128		5.95
	133		3.64
	132		3.65
	131		3.88
	141		3.27
	140		4.11
	146		1.61
	148		1.81
	147		2.77
	150		1.47
	149		1.32
	163		1.69
	162		2.01
	161		2.48
	164		1.39
	0	128	4.03
	3	133	0.91
	4	132	1.63
	5	131	1.06
	12	141	0.81
	13	140	1.52
	18	146	-1.30
	19	148	-0.86
	20	147	-0.53
	21	150	-1.38
	22	149	-2.03
	33	163	-1.25
	34	162	-0.62
	35	161	-0.80
	36	164	-1.77

Table 4-24 5G NR n260 QTM#2 *input.power.limit*

Band	Beam_ID	Paired with Beam_ID	Input.Power.Limit (dBm)
n260	2		7.76
	9		4.16
	10		5.00
	11		4.59
	16		5.21
	17		4.36
	28		1.92
	29		2.14
	30		2.97
	31		3.23
	32		1.92
	41		1.98
	42		2.33
	43		3.39
	44		2.38
	130		8.12
	139		4.89
	138		5.06
	137		4.88
	144		5.02
	145		6.06
	156		2.74
	157		2.36
	158		2.50
	159		3.10
	160		2.66
	169		2.65
	170		2.28
	171		2.88
	172		2.71
	2	130	6.92
	9	139	2.69
	10	138	3.26
	11	137	3.02
	16	144	1.90
	17	145	2.46
	28	156	-0.38
	29	157	-0.49
	30	158	0.55
	31	159	0.43
	32	160	-0.68
	41	169	-0.48
	42	170	-0.77
	43	171	0.78
	44	172	-0.27

APPENDIX A: SAR TEST RESULTS FOR *PLIMIT* CALCULATIONS

Table A-1 DSI = 1 P_{Limit} Calculations – 2G/3G Head SAR

Frequency		Mode	Service	Conducted Power	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.			[dBm]				[W/kg]	[W/kg]	[dBm]	[dBm]
836.52	384	CDMA BC0	RC3	25	Right	Cheek	1:1	0.159	1.13	33.5	33.4
836.52	384	CDMA BC0	RC3	25	Right	Tilt	1:1	0.082	1.13	36.4	
836.52	384	CDMA BC0	RC3	25	Left	Cheek	1:1	0.155	1.13	33.6	
836.52	384	CDMA BC0	RC3	25	Left	Tilt	1:1	0.075	1.13	36.8	
836.52	384	CDMA BC0	EVDO Rev.A	25	Right	Cheek	1:1	0.161	1.13	33.5	
836.52	384	CDMA BC0	EVDO Rev.A	25	Right	Tilt	1:1	0.076	1.13	36.7	
836.52	384	CDMA BC0	EVDO Rev.A	25	Left	Cheek	1:1	0.163	1.13	33.4	
836.52	384	CDMA BC0	EVDO Rev.A	25	Left	Tilt	1:1	0.081	1.13	36.5	
1880	600	PCS CDMA	RC3	24.7	Right	Cheek	1:1	0.061	1.13	37.4	37.1
1880	600	PCS CDMA	RC3	24.7	Right	Tilt	1:1	0.061	1.13	37.4	
1880	600	PCS CDMA	RC3	24.7	Left	Cheek	1:1	0.063	1.13	37.2	
1880	600	PCS CDMA	RC3	24.7	Left	Tilt	1:1	0.059	1.13	37.5	
1880	600	PCS CDMA	EVDO Rev.A	24.7	Right	Cheek	1:1	0.057	1.13	37.7	
1880	600	PCS CDMA	EVDO Rev.A	24.7	Right	Tilt	1:1	0.054	1.13	37.9	
1880	600	PCS CDMA	EVDO Rev.A	24.7	Left	Cheek	1:1	0.055	1.13	37.8	
1880	600	PCS CDMA	EVDO Rev.A	24.7	Left	Tilt	1:1	0.065	1.13	37.1	
836.6	190	GSM850	GSM	32.9	Right	Cheek	1:8.3	0.098	1.13	34.3	34.1
836.6	190	GSM850	GSM	32.9	Right	Tilt	1:8.3	0.054	1.13	36.9	
836.6	190	GSM850	GSM	32.9	Left	Cheek	1:8.3	0.103	1.13	34.1	
836.6	190	GSM850	GSM	32.9	Left	Tilt	1:8.3	0.050	1.13	37.2	
836.6	190	GSM850	GPRS	30.7	Right	Cheek	1:4.15	0.100	1.13	35.0	
836.6	190	GSM850	GPRS	30.7	Right	Tilt	1:4.15	0.051	1.13	38.0	
836.6	190	GSM850	GPRS	30.7	Left	Cheek	1:4.15	0.099	1.13	35.1	
836.6	190	GSM850	GPRS	30.7	Left	Tilt	1:4.15	0.050	1.13	38.0	
1880	661	GSM1900	GSM	29.7	Right	Cheek	1:8.3	0.031	1.13	36.2	36.2
1880	661	GSM1900	GSM	29.7	Right	Tilt	1:8.3	0.022	1.13	37.6	
1880	661	GSM1900	GSM	29.7	Left	Cheek	1:8.3	0.028	1.13	36.7	
1880	661	GSM1900	GSM	29.7	Left	Tilt	1:8.3	0.013	1.13	39.9	
1880	661	GSM1900	GPRS	28.7	Right	Cheek	1:4.15	0.047	1.13	36.4	
1880	661	GSM1900	GPRS	28.7	Right	Tilt	1:4.15	0.031	1.13	38.1	
1880	661	GSM1900	GPRS	28.7	Left	Cheek	1:4.15	0.039	1.13	37.2	
1880	661	GSM1900	GPRS	28.7	Left	Tilt	1:4.15	0.028	1.13	38.5	
836.6	4183	UMTS850	RMC	25	Right	Cheek	1:1	0.131	1.13	34.4	33.5
836.6	4183	UMTS850	RMC	25	Right	Tilt	1:1	0.069	1.13	37.2	
836.6	4183	UMTS850	RMC	25	Left	Cheek	1:1	0.161	1.13	33.5	
836.6	4183	UMTS850	RMC	25	Left	Tilt	1:1	0.056	1.13	38.0	
1880	9400	UMTS1900	RMC	24.7	Right	Cheek	1:1	0.055	1.13	37.9	37.4
1880	9400	UMTS1900	RMC	24.7	Right	Tilt	1:1	0.051	1.13	38.1	
1880	9400	UMTS1900	RMC	24.7	Left	Cheek	1:1	0.061	1.13	37.4	
1880	9400	UMTS1900	RMC	24.7	Left	Tilt	1:1	0.056	1.13	37.8	
1732.4	1412	UMTS1750	RMC	24.7	Right	Cheek	1:1	0.060	1.13	37.5	35.9
1732.4	1412	UMTS1750	RMC	24.7	Right	Tilt	1:1	0.070	1.13	36.8	
1732.4	1412	UMTS1750	RMC	24.7	Left	Cheek	1:1	0.087	1.13	35.9	
1732.4	1412	UMTS1750	RMC	24.7	Left	Tilt	1:1	0.064	1.13	37.1	

Table A-2 DSI = 1 P_{Limit} Calculations – LTE B12/13/14/26/5 Head SAR

Frequency		Mode	Bandwidth	Conducted Power	Modulation	RB Size	RB offset	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.		[MHz]	[dBm]							[W/kg]	[W/kg]	[dBm]	[dBm]
707.5	23095	LTE Band12	10	25	QPSK	1	49	Right	Cheek	1:1	0.158	1.13	33.5	33.5
707.5	23095	LTE Band12	10	24	QPSK	25	25	Right	Cheek	1:1	0.122	1.13	33.7	
707.5	23095	LTE Band12	10	25	QPSK	1	49	Right	Tilt	1:1	0.073	1.13	36.9	
707.5	23095	LTE Band12	10	24	QPSK	25	25	Right	Tilt	1:1	0.060	1.13	36.8	
707.5	23095	LTE Band12	10	25	QPSK	1	49	Left	Cheek	1:1	0.155	1.13	33.6	
707.5	23095	LTE Band12	10	24	QPSK	25	25	Left	Cheek	1:1	0.119	1.13	33.8	
707.5	23095	LTE Band12	10	25	QPSK	1	49	Left	Tilt	1:1	0.083	1.13	36.3	
707.5	23095	LTE Band12	10	24	QPSK	25	25	Left	Tilt	1:1	0.064	1.13	36.5	
782	23230	LTE Band13	10	25	QPSK	1	0	Right	Cheek	1:1	0.158	1.13	33.6	33.6
782	23230	LTE Band13	10	24	QPSK	25	12	Right	Cheek	1:1	0.121	1.13	33.7	
782	23230	LTE Band13	10	25	QPSK	1	0	Right	Tilt	1:1	0.090	1.13	36.0	
782	23230	LTE Band13	10	24	QPSK	25	12	Right	Tilt	1:1	0.068	1.13	36.2	
782	23230	LTE Band13	10	25	QPSK	1	0	Left	Cheek	1:1	0.145	1.13	33.9	
782	23230	LTE Band13	10	24	QPSK	25	12	Left	Cheek	1:1	0.116	1.13	33.9	
782	23230	LTE Band13	10	25	QPSK	1	0	Left	Tilt	1:1	0.063	1.13	37.5	
782	23230	LTE Band13	10	24	QPSK	25	12	Left	Tilt	1:1	0.051	1.13	37.4	
793	23330	LTE Band14	10	25	QPSK	1	0	Right	Cheek	1:1	0.129	1.13	34.4	34.3
793	23330	LTE Band14	10	24	QPSK	25	0	Right	Cheek	1:1	0.098	1.13	34.6	
793	23330	LTE Band14	10	25	QPSK	1	0	Right	Tilt	1:1	0.074	1.13	36.9	
793	23330	LTE Band14	10	24	QPSK	25	0	Right	Tilt	1:1	0.058	1.13	36.9	
793	23330	LTE Band14	10	25	QPSK	1	0	Left	Cheek	1:1	0.134	1.13	34.3	
793	23330	LTE Band14	10	24	QPSK	25	0	Left	Cheek	1:1	0.101	1.13	34.5	
793	23330	LTE Band14	10	25	QPSK	1	0	Left	Tilt	1:1	0.063	1.13	37.5	
793	23330	LTE Band14	10	24	QPSK	25	0	Left	Tilt	1:1	0.049	1.13	37.6	
836.5	20525	LTE Band5	10	25	QPSK	1	0	Right	Cheek	1:1	0.141	1.13	34.0	33.5
836.5	20525	LTE Band5	10	24	QPSK	1	25	Right	Cheek	1:1	0.123	1.13	33.7	
836.5	20525	LTE Band5	10	24	QPSK	25	12	Right	Cheek	1:1	0.127	1.13	33.5	
836.5	20525	LTE Band5	10	25	QPSK	1	0	Right	Cheek	1:1	0.146	1.13	33.9	
829.3	20453	LTE Band5	5			1	24			1:1				
836.5	20525	LTE Band5	10	25	QPSK	1	25	Right	Tilt	1:1	0.086	1.13	36.2	
836.5	20525	LTE Band5	10	24	QPSK	25	12	Right	Tilt	1:1	0.064	1.13	36.4	
836.5	20525	LTE Band5	10	25	QPSK	1	25	Left	Cheek	1:1	0.128	1.13	34.5	
836.5	20525	LTE Band5	10	24	QPSK	25	12	Left	Cheek	1:1	0.113	1.13	34.0	
836.5	20525	LTE Band5	10	25	QPSK	1	25	Left	Tilt	1:1	0.062	1.13	37.6	
836.5	20525	LTE Band5	10	24	QPSK	25	12	Left	Tilt	1:1	0.053	1.13	37.3	

Table A-3 DSI = 1 P_{Limit} Calculations – LTE B66/2/30/41/48 Head SAR

Frequency		Mode	Bandwidth	Conducted Power	Modulation	RB Size	RB offset	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.		[MHz]	[dBm]							[W/kg]	[W/kg]	[dBm]	[dBm]
1880	18900	LTE Band2	20	24.7	QPSK	1	99	Right	Cheek	1:1	0.077	1.13	36.4	35.9
1880	18900	LTE Band2	20	23.7	QPSK	50	50	Right	Cheek	1:1	0.063	1.13	36.2	
1880	18900	LTE Band2	20	24.7	QPSK	1	99	Right	Tilt	1:1	0.070	1.13	36.8	
1880	18900	LTE Band2	20	23.7	QPSK	50	50	Right	Tilt	1:1	0.058	1.13	36.6	
1880	18900	LTE Band2	20	24.7	QPSK	1	99	Left	Cheek	1:1	0.079	1.13	36.3	
1880	18900	LTE Band2	20	23.7	QPSK	50	50	Left	Cheek	1:1	0.068	1.13	35.9	
1880	18900	LTE Band2	20	24.7	QPSK	1	99	Left	Tilt	1:1	0.069	1.13	36.9	
1880	18900	LTE Band2	20	23.7	QPSK	50	50	Left	Tilt	1:1	0.050	1.13	37.3	
1770	132572	LTE Band66	20	24.7	QPSK	1	0	Right	Cheek	1:1	0.085	1.13	36.0	35.1
1720	132072	LTE Band66	20	23.7	QPSK	50	25	Right	Cheek	1:1	0.065	1.13	36.1	
1770	132572	LTE Band66	20	24.7	QPSK	1	0	Right	Tilt	1:1	0.066	1.13	37.0	
1720	132072	LTE Band66	20	23.7	QPSK	50	25	Right	Tilt	1:1	0.053	1.13	37.0	
1770	132572	LTE Band66	20	24.7	QPSK	1	0	Left	Cheek	1:1	0.103	1.13	35.1	
1720	132072	LTE Band66	20	23.7	QPSK	50	25	Left	Cheek	1:1	0.075	1.13	35.5	
1770	132572	LTE Band66	20	24.7	QPSK	1	0	Left	Tilt	1:1	0.059	1.13	37.5	
1720	132072	LTE Band66	20	23.7	QPSK	50	25	Left	Tilt	1:1	0.055	1.13	36.8	
2310	27710	LTE Band30	10	22.2	QPSK	1	0	Right	Cheek	1:1	0.043	1.13	36.4	35.7
2310	27710	LTE Band30	10	21.2	QPSK	25	12	Right	Cheek	1:1	0.040	1.13	35.7	
2310	27710	LTE Band30	10	22.2	QPSK	1	0	Right	Tilt	1:1	0.014	1.13	41.4	
2310	27710	LTE Band30	10	21.2	QPSK	25	12	Right	Tilt	1:1	0.008	1.13	42.5	
2310	27710	LTE Band30	10	22.2	QPSK	1	0	Left	Cheek	1:1	0.035	1.13	37.3	
2310	27710	LTE Band30	10	21.2	QPSK	25	12	Left	Cheek	1:1	0.028	1.13	37.2	
2310	27710	LTE Band30	10	22.2	QPSK	1	0	Left	Tilt	1:1	0.019	1.13	39.9	
2310	27710	LTE Band30	10	21.2	QPSK	25	12	Left	Tilt	1:1	0.014	1.13	40.2	
2636.5	41055	LTE Band41(PC3)	20	24.7	QPSK	1	50	Right	Cheek	1:1.58	0.067	1.13	35.0	35.0
2636.5	41055	LTE Band41(PC3)	20	23.7	QPSK	50	25	Right	Cheek	1:1.58	0.052	1.13	35.1	
2636.5	41055	LTE Band41(PC3)	20	24.7	QPSK	1	50	Right	Tilt	1:1.58	0.037	1.13	37.6	
2636.5	41055	LTE Band41(PC3)	20	23.7	QPSK	50	25	Right	Tilt	1:1.58	0.028	1.13	37.8	
2636.5	41055	LTE Band41(PC3)	20	24.7	QPSK	1	50	Left	Cheek	1:1.58	0.029	1.13	38.7	
2636.5	41055	LTE Band41(PC3)	20	23.7	QPSK	50	25	Left	Cheek	1:1.58	0.022	1.13	38.8	
2636.5	41055	LTE Band41(PC3)	20	24.7	QPSK	1	50	Left	Tilt	1:1.58	0.027	1.13	38.9	
2636.5	41055	LTE Band41(PC3)	20	23.7	QPSK	50	25	Left	Tilt	1:1.58	0.021	1.13	38.9	
3560	55340	LTE Band48	20	22	QPSK	1	0	Right	Cheek	1:1.58	0.144	1.13	29.0	29.0
3560	55340	LTE Band48	20	21	QPSK	50	25	Right	Cheek	1:1.58	0.111	1.13	29.1	
3560	55340	LTE Band48	20	22	QPSK	1	0	Right	Tilt	1:1.58	0.012	1.13	39.6	
3560	55340	LTE Band48	20	21	QPSK	50	25	Right	Tilt	1:1.58	0.010	1.13	39.7	
3560	55340	LTE Band48	20	22	QPSK	1	0	Left	Cheek	1:1.58	0.074	1.13	31.9	
3560	55340	LTE Band48	20	21	QPSK	50	25	Left	Cheek	1:1.58	0.057	1.13	32.0	
3560	55340	LTE Band48	20	22	QPSK	1	0	Left	Tilt	1:1.58	0.054	1.13	33.2	
3560	55340	LTE Band48	20	21	QPSK	50	25	Left	Tilt	1:1.58	0.043	1.13	33.2	

Table A-4 DSI = 1 P_{Limit} Calculations – NR Band n5/n2/n66 Head SAR

Frequency		Mode	Bandwidth	Conducted Power	Modulation	RB Size	RB offset	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.		[MHz]	[dBm]							[W/kg]	[W/kg]	[dBm]	[dBm]
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	1	Right	Cheek	1:1	0.037	1.13	39.1	37.6
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	Right	Cheek	1:1	0.036	1.13	39.2	
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	1	Right	Tilt	1:1	0.015	1.13	43.0	
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	Right	Tilt	1:1	0.015	1.13	43.1	
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	1	Left	Cheek	1:1	0.052	1.13	37.6	
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	Left	Cheek	1:1	0.051	1.13	37.6	
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	1	Left	Tilt	1:1	0.011	1.13	44.4	
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	Left	Tilt	1:1	0.010	1.13	44.6	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	Right	Cheek	1:1	0.246	1.13	31.6	31.6
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	Right	Cheek	1:1	0.249	1.13	31.6	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	Right	Tilt	1:1	0.100	1.13	35.5	
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	Right	Tilt	1:1	0.097	1.13	35.7	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	Left	Cheek	1:1	0.114	1.13	35.0	
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	Left	Cheek	1:1	0.110	1.13	35.1	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	Left	Tilt	1:1	0.120	1.13	34.7	
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	Left	Tilt	1:1	0.121	1.13	34.7	
1720	344000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	Right	Cheek	1:1	0.435	1.13	29.2	29.2
1720	344000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	Right	Cheek	1:1	0.419	1.13	29.3	
1720	344000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	Right	Tilt	1:1	0.116	1.13	34.9	
1720	344000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	Right	Tilt	1:1	0.115	1.13	34.9	
1720	344000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	Left	Cheek	1:1	0.164	1.13	33.4	
1720	344000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	Left	Cheek	1:1	0.159	1.13	33.5	
1720	344000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	Left	Tilt	1:1	0.122	1.13	34.7	
1720	344000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	Left	Tilt	1:1	0.119	1.13	34.8	

Table A-5 DSI = 1 P_{Limit} Calculations – 2G/3G Body-Worn SAR

Frequency		Mode	Service	Conducted Power	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.			[dBm]				[W/kg]	[W/kg]	[dBm]	[dBm]
836.52	384	CDMA BC0	TDSO	25	back	10mm	1:1	0.616	1.13	27.6	27.6
1851.25	25	CDMA BC1	TDSO	24.7	back	10mm	1:1	0.717	1.13	26.7	26.7
1880	600	CDMA BC1	TDSO	24.7	back	10mm	1:1	0.672	1.13	27.0	
1908.75	1175	CDMA BC1	TDSO	24.7	back	10mm	1:1	0.631	1.13	27.2	
836.6	190	GSM850	GSM	32.9	back	10mm	1:8.3	0.325	1.13	29.1	28.8
836.6	190	GSM850	GPRS	30.7	back	10mm	1:4.15	0.424	1.13	28.8	
1880	661	GSM1900	GSM	29.7	back	10mm	1:8.3	0.258	1.13	26.9	26.9
1880	661	GSM1900	GPRS	28.7	back	10mm	1:4.15	0.349	1.13	27.6	
836.6	4183	UMTS850	RMC	25	back	10mm	1:1	0.579	1.13	27.9	27.9
1852.4	9262	UMTS1900	RMC	24.7	back	10mm	1:1	0.813	1.13	26.1	26.1
1732.4	1412	UMTS1750	RMC	24.7	back	10mm	1:1	0.755	1.13	26.5	26.5

Table A-6 DSI = 1 P_{Limit} Calculations – 4G Body-Worn SAR

Frequency		Mode	Bandwidth	Conducted Power	Modulation	RB Size	RB offset	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.		[MHz]	[dBm]							[W/kg]	[W/kg]	[dBm]	[dBm]
707.5	23095	LTE Band12	10	25	QPSK	1	49	back	10mm	1:1	0.357	1.13	30.0	30.0
707.5	23095	LTE Band12	10	24	QPSK	25	25	back	10mm	1:1	0.272	1.13	30.2	
782	23230	LTE Band13	10	25	QPSK	1	0	back	10mm	1:1	0.444	1.13	29.1	29.1
782	23230	LTE Band13	10	24	QPSK	25	12	back	10mm	1:1	0.348	1.13	29.1	
793	23330	LTE Band14	10	25	QPSK	1	0	back	10mm	1:1	0.405	1.13	29.5	29.5
793	23330	LTE Band14	10	24	QPSK	25	0	back	10mm	1:1	0.310	1.13	29.6	
836.5	20525	LTE Band5	10	25	QPSK	1	49	back	10mm	1:1	0.533	1.13	28.3	28.2
836.5	20525	LTE Band5	10	24	QPSK	25	12	back	10mm	1:1	0.427	1.13	28.2	
836.5	20525	LTE Band5	10	25	QPSK	1	49	back	10mm	1:1	0.547	1.16	28.3	
843.7	20597	LTE Band5	5		QPSK	1	0							
1880	18900	LTE Band2	20	24.7	QPSK	1	99	back	10mm	1:1	0.649	1.13	27.1	27.1
1880	18900	LTE Band2	20	23.7	QPSK	50	50	back	10mm	1:1	0.503	1.13	27.2	
1720	132072	LTE Band66	20	24.7	QPSK	1	50	back	10mm	1:1	0.663	1.13	27.0	27.0
1720	132072	LTE Band66	20	23.7	QPSK	50	25	back	10mm	1:1	0.530	1.13	27.0	
2310	27710	LTE Band30	10	22.2	QPSK	1	0	back	10mm	1:1	0.355	1.13	27.2	27.2
2310	27710	LTE Band30	10	21.2	QPSK	25	12	back	10mm	1:1	0.286	1.13	27.2	
2636.5	41055	LTE Band41(PC3)	20	24.7	QPSK	1	50	back	10mm	1:1.58	0.578	1.13	25.6	25.6
2636.5	41055	LTE Band41(PC3)	20	23.7	QPSK	50	25	back	10mm	1:1.58	0.466	1.13	25.6	
3560	55340	LTE Band48	20	22	QPSK	1	0	back	10mm	1:1.58	0.998	1.13	20.6	20.6
3560	55340	LTE Band48	20	21	QPSK	50	25	back	10mm	1:1.58	0.746	1.13	20.8	

Table A-7 DSI = 1 P_{Limit} Calculations – 5G NR Sub6 Body-Worn SAR

Frequency		Mode	Bandwidth	Conducted Power	Modulation	RB Size	RB offset	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.		[MHz]	[dBm]							[W/kg]	[W/kg]	[dBm]	[dBm]
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	1	back	10mm	1:1	0.221	1.13	31.3	31.3
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	back	10mm	1:1	0.217	1.13	31.4	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	back	10mm	1:1	0.296	1.13	30.8	30.8
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	back	10mm	1:1	0.294	1.13	30.9	
1720	344000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	back	10mm	1:1	0.381	1.13	29.7	29.7
1720	344000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	back	10mm	1:1	0.372	1.13	29.8	

Table A-8 DSI = 5 P_{Limit} Calculations – 2G/3G Hotspot SAR

Frequency		Mode	Service	Conducted Power	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.			[dBm]				[W/kg]	[W/kg]	[dBm]	[dBm]
836.52	384	CDMA BC0	EVDO Rev.0	25	back	10mm	1:1	0.595	1.13	27.8	27.7
836.52	384	CDMA BC0	EVDO Rev.0	25	front	10mm	1:1	0.605	1.13	27.7	
836.52	384	CDMA BC0	EVDO Rev.0	25	bottom	10mm	1:1	0.208	1.13	32.4	
836.52	384	CDMA BC0	EVDO Rev.0	25	right	10mm	1:1	0.194	1.13	32.7	
1880	600	PCS CDMA	EVDO Rev.0	24.7	back	10mm	1:1	0.628	1.13	27.3	23.8
1880	600	PCS CDMA	EVDO Rev.0	24.7	front	10mm	1:1	0.651	1.13	27.1	
1851.25	25	PCS CDMA	EVDO Rev.0	24.7	bottom	10mm	1:1	1.226	1.13	24.4	
1880	600	PCS CDMA	EVDO Rev.0	24.7	bottom	10mm	1:1	1.326	1.13	24.0	
1908.75	1175	PCS CDMA	EVDO Rev.0	24.7	bottom	10mm	1:1	1.399	1.13	23.8	
1880	600	PCS CDMA	EVDO Rev.0	24.7	left	10mm	1:1	0.164	1.13	33.1	
836.6	190	GSM850	GPRS	30.7	back	10mm	1:4.15	0.422	1.13	28.8	28.8
836.6	190	GSM850	GPRS	30.7	front	10mm	1:4.15	0.409	1.13	28.9	
836.6	190	GSM850	GPRS	30.7	bottom	10mm	1:4.15	0.165	1.13	32.9	
836.6	190	GSM850	GPRS	30.7	right	10mm	1:4.15	0.144	1.13	33.5	
1880	661	GSM1900	GPRS	28.7	back	10mm	1:4.15	0.350	1.13	27.6	23.7
1880	661	GSM1900	GPRS	28.7	front	10mm	1:4.15	0.359	1.13	27.5	
1850.2	512	GSM1900	GPRS	28.7	bottom	10mm	1:4.15	0.753	1.13	24.3	
1880	661	GSM1900	GPRS	28.7	bottom	10mm	1:4.15	0.682	1.13	24.7	
1909.8	810	GSM1900	GPRS	28.7	bottom	10mm	1:4.15	0.854	1.13	23.7	
1880	661	GSM1900	GPRS	28.7	left	10mm	1:4.15	0.092	1.13	33.4	
836.6	4183	UMTS850	RMC	25	back	10mm	1:1	0.578	1.13	27.9	27.3
836.6	4183	UMTS850	RMC	25	front	10mm	1:1	0.665	1.13	27.3	
836.6	4183	UMTS850	RMC	25	bottom	10mm	1:1	0.232	1.13	31.9	
836.6	4183	UMTS850	RMC	25	right	10mm	1:1	0.224	1.13	32.0	
1880	9400	UMTS1900	RMC	24.7	back	10mm	1:1	0.833	1.13	26.0	23.4
1880	9400	UMTS1900	RMC	24.7	front	10mm	1:1	0.717	1.13	26.7	
1852.4	9262	UMTS1900	RMC	24.7	bottom	10mm	1:1	1.388	1.13	23.8	
1880	9400	UMTS1900	RMC	24.7	bottom	10mm	1:1	1.466	1.13	23.6	
1907.6	9538	UMTS1900	RMC	24.7	bottom	10mm	1:1	1.535	1.13	23.4	
1880	9400	UMTS1900	RMC	24.7	left	10mm	1:1	0.216	1.13	31.9	
1732.4	1412	UMTS1750	RMC	24.7	back	10mm	1:1	0.753	1.13	26.5	24.4
1732.4	1412	UMTS1750	RMC	24.7	front	10mm	1:1	0.703	1.13	26.8	
1712.4	1312	UMTS1750	RMC	24.7	bottom	10mm	1:1	1.026	1.13	25.1	
1732.4	1412	UMTS1750	RMC	24.7	bottom	10mm	1:1	1.126	1.13	24.7	
1752.6	1513	UMTS1750	RMC	24.7	bottom	10mm	1:1	1.223	1.13	24.4	
1732.4	1412	UMTS1750	RMC	24.7	left	10mm	1:1	0.222	1.13	31.8	

For some bands/modes, a lower PLimit was selected as a more conservative evaluation.

Table A-9 DSI = 5 P_{Limit} Calculations – LTE B12/13/14/26/5 Hotspot SAR

Frequency		Mode	Bandwidth	Conducted Power	Modulation	RB Size	RB offset	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.		[MHz]	[dBm]							[W/kg]	[W/kg]	[dBm]	[dBm]
707.5	23095	LTE Band12	10	25	QPSK	1	49	back	10mm	1:1	0.357	1.13	30.0	30.0
707.5	23095	LTE Band12	10	24	QPSK	25	25	back	10mm	1:1	0.281	1.13	30.1	
707.5	23095	LTE Band12	10	25	QPSK	1	49	front	10mm	1:1	0.338	1.13	30.3	
707.5	23095	LTE Band12	10	24	QPSK	25	25	front	10mm	1:1	0.262	1.13	30.4	
707.5	23095	LTE Band12	10	25	QPSK	1	49	bottom	10mm	1:1	0.127	1.13	34.5	
707.5	23095	LTE Band12	10	24	QPSK	25	25	bottom	10mm	1:1	0.100	1.13	34.6	
707.5	23095	LTE Band12	10	25	QPSK	1	49	right	10mm	1:1	0.330	1.13	30.4	
707.5	23095	LTE Band12	10	24	QPSK	25	25	right	10mm	1:1	0.261	1.13	30.4	
782	23230	LTE Band13	10	25	QPSK	1	0	back	10mm	1:1	0.444	1.13	29.1	29.1
782	23230	LTE Band13	10	24	QPSK	25	12	back	10mm	1:1	0.339	1.13	29.2	
782	23230	LTE Band13	10	25	QPSK	1	0	front	10mm	1:1	0.354	1.13	30.1	
782	23230	LTE Band13	10	24	QPSK	25	12	front	10mm	1:1	0.272	1.13	30.2	
782	23230	LTE Band13	10	25	QPSK	1	0	bottom	10mm	1:1	0.144	1.13	34.0	
782	23230	LTE Band13	10	24	QPSK	25	12	bottom	10mm	1:1	0.110	1.13	34.1	
782	23230	LTE Band13	10	25	QPSK	1	0	right	10mm	1:1	0.218	1.13	32.2	
782	23230	LTE Band13	10	24	QPSK	25	12	right	10mm	1:1	0.173	1.13	32.2	
793	23330	LTE Band14	10	25	QPSK	1	0	back	10mm	1:1	0.405	1.13	29.5	29.5
793	23330	LTE Band14	10	24	QPSK	25	12	back	10mm	1:1	0.310	1.13	29.6	
793	23330	LTE Band14	10	25	QPSK	1	0	front	10mm	1:1	0.332	1.13	30.3	
793	23330	LTE Band14	10	24	QPSK	25	12	front	10mm	1:1	0.264	1.13	30.3	
793	23330	LTE Band14	10	25	QPSK	1	0	bottom	10mm	1:1	0.124	1.13	34.6	
793	23330	LTE Band14	10	24	QPSK	25	12	bottom	10mm	1:1	0.097	1.13	34.7	
793	23330	LTE Band14	10	25	QPSK	1	0	right	10mm	1:1	0.255	1.13	31.5	
793	23330	LTE Band14	10	24	QPSK	25	12	right	10mm	1:1	0.196	1.13	31.6	
836.5	20525	LTE Band5	10	25	QPSK	1	25	back	10mm	1:1	0.529	1.13	28.3	27.9
836.5	20525	LTE Band5	10	24	QPSK	25	12	back	10mm	1:1	0.416	1.13	28.3	
836.5	20525	LTE Band5	10	25	QPSK	1	0	back	10mm	1:1	0.579	1.13	27.9	
829.3	20453	LTE Band5	5		QPSK	1	24	back	10mm	1:1				
836.5	20525	LTE Band5	10	25	QPSK	1	25	front	10mm	1:1	0.564	1.13	28.0	
836.5	20525	LTE Band5	10	24	QPSK	25	12	front	10mm	1:1	0.455	1.13	28.0	
836.5	20525	LTE Band5	10	25	QPSK	1	25	bottom	10mm	1:1	0.200	1.13	32.5	
836.5	20525	LTE Band5	10	24	QPSK	25	12	bottom	10mm	1:1	0.157	1.13	32.6	
836.5	20525	LTE Band5	10	25	QPSK	1	25	right	10mm	1:1	0.176	1.13	33.1	
836.5	20525	LTE Band5	10	24	QPSK	25	12	right	10mm	1:1	0.140	1.13	33.1	

Table A-10 DSI = 5 P_{Limit} Calculations – LTE B66/2/30/41/48 Hotspot SAR

Frequency		Mode	Bandwidth	Conducted Power	Modulation	RB Size	RB offset	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.		[MHz]	[dBm]							[W/kg]	[W/kg]	[dBm]	[dBm]
1880	18900	LTE Band2	20	24.7	QPSK	1	0	back	10mm	1:1	0.741	1.13	26.5	23.5
1860	18700	LTE Band2	20	23.7	QPSK	50	25	back	10mm	1:1	0.599	1.13	26.5	
1880	18900	LTE Band2	20	24.7	QPSK	1	0	front	10mm	1:1	0.653	1.13	27.1	
1860	18700	LTE Band2	20	23.7	QPSK	50	25	front	10mm	1:1	0.527	1.13	27.0	
1860	18700	LTE Band2	20	24.7	QPSK	1	99	bottom	10mm	1:1	1.357	1.13	23.9	
1880	18900	LTE Band2	20	24.7	QPSK	1	0	bottom	10mm	1:1	1.351	1.13	23.9	
1900	19100	LTE Band2	20	24.7	QPSK	1	50	bottom	10mm	1:1	1.361	1.13	23.9	
1860	18700	LTE Band2	20	23.7	QPSK	50	25	bottom	10mm	1:1	1.143	1.13	23.7	
1880	18900	LTE Band2	20	23.7	QPSK	50	25	bottom	10mm	1:1	1.152	1.13	23.6	
1900	19100	LTE Band2	20	23.7	QPSK	50	25	bottom	10mm	1:1	1.191	1.13	23.5	
1860	18700	LTE Band2	20	23.7	QPSK	100	0	bottom	10mm	1:1	1.049	1.13	24.0	
1880	18900	LTE Band2	20	24.7	QPSK	1	0	left	10mm	1:1	0.211	1.13	32.0	
1860	18700	LTE Band2	20	23.7	QPSK	50	25	left	10mm	1:1	0.163	1.13	32.1	
1720	132072	LTE Band66	20	24.7	QPSK	1	50	back	10mm	1:1	0.673	1.13	27.0	24.2
1720	132072	LTE Band66	20	23.7	QPSK	50	25	back	10mm	1:1	0.531	1.13	27.0	
1720	132072	LTE Band66	20	24.7	QPSK	1	50	front	10mm	1:1	0.658	1.13	27.1	
1720	132072	LTE Band66	20	23.7	QPSK	50	25	front	10mm	1:1	0.518	1.13	27.1	
1720	132072	LTE Band66	20	24.7	QPSK	1	50	bottom	10mm	1:1	1.048	1.13	25.0	
1720	132072	LTE Band66	20	23.7	QPSK	50	25	bottom	10mm	1:1	0.847	1.13	25.0	
1745	132322	LTE Band66	20	23.7	QPSK	50	25	bottom	10mm	1:1	0.903	1.13	24.7	
1770	132572	LTE Band66	20	23.7	QPSK	50	25	bottom	10mm	1:1	1.002	1.13	24.2	
1720	132072	LTE Band66	20	24.7	QPSK	1	50	left	10mm	1:1	0.205	1.13	32.1	
1720	132072	LTE Band66	20	23.7	QPSK	50	25	left	10mm	1:1	0.163	1.13	32.1	
2310	27710	LTE Band30	10	22.2	QPSK	1	0	back	10mm	1:1	0.354	1.13	27.3	24.6
2310	27710	LTE Band30	10	21.2	QPSK	25	12	back	10mm	1:1	0.273	1.13	27.4	
2310	27710	LTE Band30	10	22.2	QPSK	1	0	front	10mm	1:1	0.373	1.13	27.0	
2310	27710	LTE Band30	10	21.2	QPSK	25	12	front	10mm	1:1	0.301	1.13	27.0	
2310	27710	LTE Band30	10	22.2	QPSK	1	0	bottom	10mm	1:1	0.649	1.13	24.6	
2310	27710	LTE Band30	10	21.2	QPSK	25	12	bottom	10mm	1:1	0.521	1.13	24.6	
2310	27710	LTE Band30	10	22.2	QPSK	1	0	left	10mm	1:1	0.090	1.13	33.2	
2310	27710	LTE Band30	10	21.2	QPSK	25	12	left	10mm	1:1	0.070	1.13	33.3	
2636.5	41055	LTE Band41	20	24.7	QPSK	1	50	back	10mm	1:1.58	0.578	1.13	25.6	24.2
2636.5	41055	LTE Band41	20	23.7	QPSK	50	25	back	10mm	1:1.58	0.466	1.13	25.6	
2636.5	41055	LTE Band41	20	24.7	QPSK	1	50	front	10mm	1:1.58	0.331	1.13	28.1	
2636.5	41055	LTE Band41	20	23.7	QPSK	50	25	front	10mm	1:1.58	0.262	1.13	28.1	
2636.5	41055	LTE Band41	20	24.7	QPSK	1	50	bottom	10mm	1:1.58	0.811	1.13	24.2	
2636.5	41055	LTE Band41	20	23.7	QPSK	50	25	bottom	10mm	1:1.58	0.645	1.13	24.2	
2636.5	41055	LTE Band41	20	24.7	QPSK	1	50	left	10mm	1:1.58	0.087	1.13	33.8	
2636.5	41055	LTE Band41	20	23.7	QPSK	50	25	left	10mm	1:1.58	0.070	1.13	33.8	
3646.7	56207	LTE Band48	20	22	QPSK	1	99	back	10mm	1:1.58	0.997	1.13	20.6	20.6
3646.7	56207	LTE Band48	20	21	QPSK	50	25	back	10mm	1:1.58	0.767	1.13	20.7	
3646.7	56207	LTE Band48	20	22	QPSK	1	99	front	10mm	1:1.58	0.031	1.13	35.7	
3646.7	56207	LTE Band48	20	21	QPSK	50	25	front	10mm	1:1.58	0.024	1.13	35.7	
3646.7	56207	LTE Band48	20	22	QPSK	1	99	right	10mm	1:1.58	0.373	1.13	24.8	
3646.7	56207	LTE Band48	20	21	QPSK	50	25	right	10mm	1:1.58	0.293	1.13	24.9	

For some bands/modes, a lower PLimit was selected as a more conservative evaluation.

Table A-11 DSI = 5 P_{Limit} Calculations – NR Band n5/n2/n66 Hotspot SAR

Frequency		Mode	Bandwidth	Conducted Power	Modulation	RB Size	RB offset	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.		[MHz]	[dBm]							[W/kg]	[W/kg]	[dBm]	[dBm]
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	1	back	10mm	1:1	0.222	1.13	31.3	31.3
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	back	10mm	1:1	0.218	1.13	31.3	
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	1	front	10mm	1:1	0.121	1.13	33.9	
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	front	10mm	1:1	0.122	1.13	33.9	
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	1	bottom	10mm	1:1	0.042	1.13	38.5	
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	bottom	10mm	1:1	0.042	1.13	38.5	
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	1	right	10mm	1:1	0.050	1.13	37.8	
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	right	10mm	1:1	0.050	1.13	37.8	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	back	10mm	1:1	0.295	1.13	30.8	28.2
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	back	10mm	1:1	0.293	1.13	30.9	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	front	10mm	1:1	0.372	1.13	29.8	
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	front	10mm	1:1	0.384	1.13	29.7	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	bottom	10mm	1:1	0.075	1.13	36.8	
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	bottom	10mm	1:1	0.077	1.13	36.7	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	right	10mm	1:1	0.545	1.13	28.2	
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	right	10mm	1:1	0.538	1.13	28.2	
1745	349000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	back	10mm	1:1	0.386	1.13	29.7	26.9
1745	349000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	back	10mm	1:1	0.372	1.13	29.8	
1745	349000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	front	10mm	1:1	0.405	1.13	29.5	
1745	349000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	front	10mm	1:1	0.393	1.13	29.6	
1745	349000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	bottom	10mm	1:1	0.017	1.13	43.2	
1745	349000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	bottom	10mm	1:1	0.016	1.13	43.4	
1745	349000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	right	10mm	1:1	0.730	1.13	26.9	
1745	349000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	right	10mm	1:1	0.699	1.13	27.1	

Table A-12 DSI = 1 P_{Limit} Calculations – 2G/3G Phablet SAR

Frequency		Mode	Service	Conducted Power	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.			[dBm]				[W/kg]	[W/kg]	[dBm]	[dBm]
836.52	384	CDMA BC0	EVDO Rev.0	25	back	0mm	1:1	1.369	2.83	28.2	28.2
836.52	384	CDMA BC0	EVDO Rev.0	25	front	0mm	1:1	1.282	2.83	28.4	
836.52	384	CDMA BC0	EVDO Rev.0	25	bottom	0mm	1:1	0.579	2.83	31.9	
836.52	384	CDMA BC0	EVDO Rev.0	25	right	0mm	1:1	0.251	2.83	35.5	
836.6	190	GSM850	GPRS	30.7	back	0mm	1:4.15	0.789	2.83	30.1	30.1
836.6	190	GSM850	GPRS	30.7	front	0mm	1:4.15	0.756	2.83	30.3	
836.6	190	GSM850	GPRS	30.7	bottom	0mm	1:4.15	0.290	2.83	34.4	
836.6	190	GSM850	GPRS	30.7	right	0mm	1:4.15	0.154	2.83	37.2	
1880	661	GSM1900	GPRS	28.7	back	0mm	1:4.15	0.887	2.83	27.6	25.0
1880	661	GSM1900	GPRS	28.7	front	0mm	1:4.15	0.784	2.83	28.1	
1880	661	GSM1900	GPRS	28.7	bottom	0mm	1:4.15	1.602	2.83	25.0	
1880	661	GSM1900	GPRS	28.7	left	0mm	1:4.15	0.210	2.83	33.8	
836.6	4183	UMTS850	RMC	25	back	0mm	1:1	1.230	2.83	28.6	28.5
836.6	4183	UMTS850	RMC	25	front	0mm	1:1	1.262	2.83	28.5	
836.6	4183	UMTS850	RMC	25	bottom	0mm	1:1	0.548	2.83	32.1	
836.6	4183	UMTS850	RMC	25	right	0mm	1:1	0.249	2.83	35.6	
1880	600	PCS CDMA	EVDO Rev.0	24.7	back	2mm	1:1	1.392	2.83	27.8	26.6
1880	600	PCS CDMA	EVDO Rev.0	24.7	front	1mm	1:1	1.414	2.83	27.7	
1880	600	PCS CDMA	EVDO Rev.0	24.7	bottom	3mm	1:1	1.826	2.83	26.6	
1880	600	PCS CDMA	EVDO Rev.0	24.7	left	0mm	1:1	0.496	2.83	32.3	
1880	9400	UMTS 1900	RMC	24.7	back	2mm	1:1	1.221	2.83	28.4	26.0
1880	9400	UMTS 1900	RMC	24.7	front	1mm	1:1	2.087	2.83	26.0	
1880	9400	UMTS 1900	RMC	24.7	bottom	3mm	1:1	1.980	2.83	26.3	
1880	9400	UMTS 1900	RMC	24.7	left	0mm	1:1	0.485	2.83	32.4	
1732.4	1412	UMTS1750	RMC	24.7	back	2mm	1:1	1.283	2.83	28.1	26.2
1732.4	1412	UMTS1750	RMC	24.7	front	1mm	1:1	2.004	2.83	26.2	
1732.4	1412	UMTS1750	RMC	24.7	bottom	3mm	1:1	1.587	2.83	27.2	
1732.4	1412	UMTS1750	RMC	24.7	left	0mm	1:1	0.576	2.83	31.6	

Table A-13 DSI = 8 P_{Limit} Calculations – 2G/3G Phablet SAR

Frequency		Mode	Service	Conducted Power	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.			[dBm]				[W/kg]	[W/kg]	[dBm]	[dBm]
1880	600	PCS CDMA	EVDO Rev.0	24.7	back	0mm	1:1	2.519	2.83	25.2	22.6
1880	600	PCS CDMA	EVDO Rev.0	24.7	front	0mm	1:1	2.722	2.83	24.9	
1851.25	25	PCS CDMA	EVDO Rev.0	24.7	bottom	0mm	1:1	4.061	2.83	23.1	
1880	600	PCS CDMA	EVDO Rev.0	24.7	bottom	0mm	1:1	4.392	2.83	22.8	
1908.75	1175	PCS CDMA	EVDO Rev.0	24.7	bottom	0mm	1:1	4.619	2.83	22.6	
1880	9400	UMTS1900	RMC	24.7	back	0mm	1:1	2.940	2.83	24.5	22.4
1880	9400	UMTS1900	RMC	24.7	front	0mm	1:1	3.558	2.83	23.7	
1852.4	9262	UMTS1900	RMC	24.7	bottom	0mm	1:1	4.352	2.83	22.8	
1880	9400	UMTS1900	RMC	24.7	bottom	0mm	1:1	4.665	2.83	22.5	
1907.6	9538	UMTS1900	RMC	24.7	bottom	0mm	1:1	4.828	2.83	22.4	
1732.4	1412	UMTS1750	RMC	24.7	back	0mm	1:1	2.285	2.83	25.6	24.3
1732.4	1412	UMTS1750	RMC	24.7	front	0mm	1:1	2.703	2.83	24.9	
1732.4	1412	UMTS1750	RMC	24.7	bottom	0mm	1:1	3.098	2.83	24.3	

For some bands/modes, a lower PLimit was selected as a more conservative evaluation.

Table A-14 DSI = 1 P_{Limit} Calculations – 4G Phablet SAR

Frequency		Mode	Bandwidth	Conducted Power	Modulation	RB Size	RB offset	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.		[MHz]	[dBm]							[W/kg]	[W/kg]	[dBm]	[dBm]
707.5	23095	LTE Band12	10	25	QPSK	1	49	back	0mm	1:1	0.828	2.83	30.3	30.3
707.5	23095	LTE Band12	10	24	QPSK	25	12	back	0mm	1:1	0.670	2.83	30.3	
707.5	23095	LTE Band12	10	25	QPSK	1	49	front	0mm	1:1	0.782	2.83	30.6	
707.5	23095	LTE Band12	10	24	QPSK	25	12	front	0mm	1:1	0.621	2.83	30.6	
707.5	23095	LTE Band12	10	25	QPSK	1	49	bottom	0mm	1:1	0.298	2.83	34.8	
707.5	23095	LTE Band12	10	24	QPSK	25	12	bottom	0mm	1:1	0.233	2.83	34.9	
707.5	23095	LTE Band12	10	25	QPSK	1	49	right	0mm	1:1	0.689	2.83	31.1	
707.5	23095	LTE Band12	10	24	QPSK	25	12	right	0mm	1:1	0.546	2.83	31.1	
782	23230	LTE Band13	10	25	QPSK	1	25	back	0mm	1:1	0.992	2.83	29.6	29.6
782	23230	LTE Band13	10	24	QPSK	25	12	back	0mm	1:1	0.774	2.83	29.6	
782	23230	LTE Band13	10	25	QPSK	1	25	front	0mm	1:1	0.919	2.83	29.9	
782	23230	LTE Band13	10	24	QPSK	25	12	front	0mm	1:1	0.708	2.83	30.0	
782	23230	LTE Band13	10	25	QPSK	1	25	bottom	0mm	1:1	0.319	2.83	34.5	
782	23230	LTE Band13	10	24	QPSK	25	12	bottom	0mm	1:1	0.250	2.83	34.5	
782	23230	LTE Band13	10	25	QPSK	1	25	right	0mm	1:1	0.436	2.83	33.1	
782	23230	LTE Band13	10	24	QPSK	25	12	right	0mm	1:1	0.349	2.83	33.1	
793	23330	LTE Band14	10	25	QPSK	1	0	back	0mm	1:1	0.855	2.83	30.2	30.1
793	23330	LTE Band14	10	24	QPSK	25	12	back	0mm	1:1	0.672	2.83	30.2	
793	23330	LTE Band14	10	25	QPSK	1	0	front	0mm	1:1	0.882	2.83	30.1	
793	23330	LTE Band14	10	24	QPSK	25	12	front	0mm	1:1	0.695	2.83	30.1	
793	23330	LTE Band14	10	25	QPSK	1	0	bottom	0mm	1:1	0.309	2.83	34.6	
793	23330	LTE Band14	10	24	QPSK	25	12	bottom	0mm	1:1	0.247	2.83	34.6	
793	23330	LTE Band14	10	25	QPSK	1	0	right	0mm	1:1	0.374	2.83	33.8	
793	23330	LTE Band14	10	24	QPSK	25	12	right	0mm	1:1	0.295	2.83	33.8	
836.5	20525	LTE Band5	10	25	QPSK	1	49	back	0mm	1:1	1.237	2.83	28.6	28.6
836.5	20525	LTE Band5	10	24	QPSK	25	12	back	0mm	1:1	0.982	2.83	28.6	
836.5	20525	LTE Band5	10	25	QPSK	1	49	front	0mm	1:1	1.188	2.83	28.8	
836.5	20525	LTE Band5	10	24	QPSK	25	12	front	0mm	1:1	0.979	2.83	28.6	
836.5	20525	LTE Band5	10	25	QPSK	1	49	bottom	0mm	1:1	0.542	2.83	32.2	
836.5	20525	LTE Band5	10	24	QPSK	25	12	bottom	0mm	1:1	0.416	2.83	32.3	
836.5	20525	LTE Band5	10	25	QPSK	1	49	right	0mm	1:1	0.253	2.83	35.5	
836.5	20525	LTE Band5	10	24	QPSK	25	12	right	0mm	1:1	0.195	2.83	35.6	
1880	18900	LTE Band2	20	24.7	QPSK	1	99	back	2mm	1:1	1.349	2.83	27.9	25.5
1880	18900	LTE Band2	20	23.7	QPSK	50	50	back	2mm	1:1	1.171	2.83	27.5	
1880	18900	LTE Band2	20	24.7	QPSK	1	99	front	1mm	1:1	2.149	2.83	25.9	
1880	18900	LTE Band2	20	23.7	QPSK	50	50	front	1mm	1:1	1.850	2.83	25.5	
1880	18900	LTE Band2	20	24.7	QPSK	1	99	bottom	3mm	1:1	2.067	2.83	26.1	
1880	18900	LTE Band2	20	23.7	QPSK	50	50	bottom	3mm	1:1	1.766	2.83	25.7	
1880	18900	LTE Band2	20	24.7	QPSK	1	99	left	0mm	1:1	0.522	2.83	32.0	
1880	18900	LTE Band2	20	23.7	QPSK	50	50	left	0mm	1:1	0.429	2.83	31.9	
1770	132572	LTE Band66	20	24.7	QPSK	1	0	back	2mm	1:1	1.540	2.83	27.3	25.5
1720	132072	LTE Band66	20	23.7	QPSK	50	25	back	2mm	1:1	1.210	2.83	27.4	
1770	132572	LTE Band66	20	24.7	QPSK	1	0	front	1mm	1:1	2.333	2.83	25.5	
1720	132072	LTE Band66	20	23.7	QPSK	50	25	front	1mm	1:1	1.761	2.83	25.8	
1770	132572	LTE Band66	20	24.7	QPSK	1	0	bottom	3mm	1:1	1.719	2.83	26.9	
1720	132072	LTE Band66	20	23.7	QPSK	50	25	bottom	3mm	1:1	1.281	2.83	27.1	
1770	132572	LTE Band66	20	24.7	QPSK	1	0	left	0mm	1:1	0.639	2.83	31.2	
1720	132072	LTE Band66	20	23.7	QPSK	50	25	left	0mm	1:1	0.482	2.83	31.4	
2310	27710	LTE Band30	10	22.2	QPSK	1	0	back	0mm	1:1	1.072	2.83	26.4	24.7
2310	27710	LTE Band30	10	21.2	QPSK	25	12	back	0mm	1:1	0.880	2.83	26.3	
2310	27710	LTE Band30	10	22.2	QPSK	1	25	front	0mm	1:1	1.024	2.83	26.6	
2310	27710	LTE Band30	10	21.2	QPSK	25	12	front	0mm	1:1	0.783	2.83	26.8	
2310	27710	LTE Band30	10	22.2	QPSK	1	25	bottom	0mm	1:1	1.601	2.83	24.7	
2310	27710	LTE Band30	10	21.2	QPSK	25	12	bottom	0mm	1:1	1.265	2.83	24.7	
2680	41490	LTE Band41	20	24.7	QPSK	1	50	back	0mm	1:1.58	1.434	2.83	25.7	22.9
2680	41490	LTE Band41	20	23.7	QPSK	50	50	back	0mm	1:1.58	1.178	2.83	25.5	
2680	41490	LTE Band41	20	24.7	QPSK	1	50	front	0mm	1:1.58	1.481	2.83	25.5	
2680	41490	LTE Band41	20	23.7	QPSK	50	50	front	0mm	1:1.58	1.219	2.83	25.4	
2680	41490	LTE Band41	20	24.7	QPSK	1	50	bottom	0mm	1:1.58	2.737	2.83	22.9	
2680	41490	LTE Band41	20	23.7	QPSK	50	50	bottom	0mm	1:1.58	2.154	2.83	22.9	
3646.7	56207	LTE Band48	20	22	QPSK	1	50	back	0mm	1:1.58	2.633	2.83	20.3	20.3
3646.7	56207	LTE Band48	20	21	QPSK	50	25	back	0mm	1:1.58	2.097	2.83	20.3	
3646.7	56207	LTE Band48	20	22	QPSK	1	50	front	0mm	1:1.58	0.391	2.83	28.6	
3646.7	56207	LTE Band48	20	21	QPSK	50	25	front	0mm	1:1.58	0.309	2.83	28.6	
3646.7	56207	LTE Band48	20	22	QPSK	1	50	right	0mm	1:1.58	1.489	2.83	22.8	
3646.7	56207	LTE Band48	20	21	QPSK	50	25	right	0mm	1:1.58	1.298	2.83	22.4	

Table A-15 DSI = 8 P_{Limit} Calculations – 4G Phablet SAR

Frequency		Mode	Bandwidth	Conducted Power	Modulation	RB Size	RB offset	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.		[MHz]	[dBm]							[W/kg]	[W/kg]	[dBm]	[dBm]
1880	18900	LTE Band2	20	24.7	QPSK	1	0	back	0mm	1:1	3.064	2.83	24.4	22.4
1860	18700	LTE Band2	20	23.7	QPSK	50	25	back	0mm	1:1	2.426	2.83	24.4	
1880	18900	LTE Band2	20	24.7	QPSK	1	0	front	0mm	1:1	3.277	2.83	24.1	
1880	18900	LTE Band2	20	23.7	QPSK	50	25	front	0mm	1:1	2.648	2.83	24.0	
1860	18700	LTE Band2	20	24.7	QPSK	1	99	bottom	0mm	1:1	4.497	2.83	22.7	
1880	18900	LTE Band2	20	24.7	QPSK	1	0	bottom	0mm	1:1	4.491	2.83	22.7	
1900	19100	LTE Band2	20	24.7	QPSK	1	50	bottom	0mm	1:1	4.784	2.83	22.4	
1860	18700	LTE Band2	20	23.7	QPSK	50	25	bottom	0mm	1:1	3.548	2.83	22.7	
1880	18900	LTE Band2	20	23.7	QPSK	50	25	bottom	0mm	1:1	3.764	2.83	22.5	
1900	19100	LTE Band2	20	23.7	QPSK	50	25	bottom	0mm	1:1	3.855	2.83	22.4	
1860	18700	LTE Band2	20	23.7	QPSK	100	0	bottom	0mm	1:1	3.703	2.83	22.5	
1720	132072	LTE Band66	20	24.7	QPSK	1	50	back	0mm	1:1	2.610	2.83	25.1	24.5
1720	132072	LTE Band66	20	23.7	QPSK	50	25	back	0mm	1:1	2.107	2.83	25.0	
1720	132072	LTE Band66	20	24.7	QPSK	1	50	front	0mm	1:1	2.854	2.83	24.7	
1720	132072	LTE Band66	20	23.7	QPSK	50	25	front	0mm	1:1	2.325	2.83	24.6	
1720	132072	LTE Band66	20	24.7	QPSK	1	50	bottom	0mm	1:1	2.913	2.83	24.6	
1720	132072	LTE Band66	20	23.7	QPSK	100	0	bottom	0mm	1:1	2.364	2.83	24.5	

For some bands/modes, a lower PLimit was selected as a more conservative evaluation.

Table A-16 DSI = 1 P_{Limit} Calculations – 5G Sub6 Phablet SAR

Frequency		Mode	Bandwidth	Conducted Power	Modulation	RB Size	RB offset	Test Position	Spacing	Duty Cycle	SAR (1g)	SAR design target	Plimit	Min Plimit
MHz	Ch.		[MHz]	[dBm]							[W/kg]	[W/kg]	[dBm]	[dBm]
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	53	back	0mm	1:1	0.845	2.83	29.5	29.5
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	back	0mm	1:1	0.819	2.83	29.6	
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	53	front	0mm	1:1	0.796	2.83	29.7	
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	front	0mm	1:1	0.834	2.83	29.5	
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	53	bottom	0mm	1:1	0.346	2.83	33.3	
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	bottom	0mm	1:1	0.330	2.83	33.5	
836.5	167300	NR Band n5	20	24.2	DFT-s-OFDM-QPSK	1	53	right	0mm	1:1	0.177	2.83	36.2	
836.5	167300	NR Band n5	20	24.2	CP-OFDM-QPSK	1	1	right	0mm	1:1	0.171	2.83	36.4	
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	right	0mm	1:1	4.251	2.83	23.2	23.2
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	right	0mm	1:1	4.165	2.83	23.3	
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	back	0mm	1:1	3.656	2.83	23.9	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	back	0mm	1:1	3.714	2.83	23.8	
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	front	0mm	1:1	3.607	2.83	23.9	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	front	0mm	1:1	3.720	2.83	23.8	
1880	376000	NR Band n2	20	25	CP-OFDM-QPSK	1	1	bottom	0mm	1:1	4.249	2.83	23.2	
1880	376000	NR Band n2	20	25	DFT-s-OFDM-QPSK	1	104	bottom	0mm	1:1	4.153	2.83	23.3	
1745	349000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	right	0mm	1:1	3.748	2.83	23.8	23.4
1745	349000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	right	0mm	1:1	3.709	2.83	23.8	
1745	349000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	back	0mm	1:1	3.106	2.83	24.6	
1745	349000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	back	0mm	1:1	3.011	2.83	24.7	
1745	349000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	front	0mm	1:1	3.318	2.83	24.3	
1745	349000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	front	0mm	1:1	3.118	2.83	24.6	
1745	349000	NR Band n66	20	25	DFT-s-OFDM-QPSK	1	104	bottom	0mm	1:1	4.111	2.83	23.4	
1745	349000	NR Band n66	20	25	CP-OFDM-QPSK	1	1	bottom	0mm	1:1	4.072	2.83	23.4	